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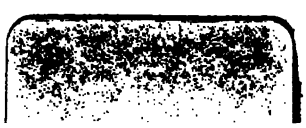

THE

SYDNEY MAGAZINE

OF

SCIENCE AND ART,

CONTAINING, BY AUTHORITY, THE PROCEEDINGS OF THE

AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY,

AND THE

PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

VOLUME II.

EDITED BY MR. JOSEPH DYER.

SYDNEY:
JAMES W. WAUGH, PUBLISHER,
286, GEORGE STREET.

1859.

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PREFACE.

In offering the second volume of the Sydney Magazine of Science and Art to our Subscribers, we have to express our regret that some considerable, but unavoidable, delay has occurred in the issue of the latter numbers of that periodical. The volume will, we trust, be found to contain a large amount of information valuable to the colonial community, gathered from the papers of the two Societies whose proceedings this periodical was established to preserve.

It is to be regretted, on public grounds, that these papers are not more widely dispersed. Previously to their appearance in this form, they were printed in the pages of the daily journals; but in them it was found that they were buried by the more exciting topics of the day, and were rendered useless for purposes of reference by the ephemeral character of the medium in which they appeared. In their present form, although we must confess that these papers have not obtained such extended publicity as they would have had in the daily journals, yet they have secured the advantage of becoming permanently available. We claim no credit for ourselves in asserting the value of the papers herein contained, but would remark, that if, at any time, information is required on various topics of colonial importance, the present and the preceding volume must be referred to, as being, we believe, the only records of colonial experience. Thus—on the Cultivation of the Sorghum Saccharatum, and the making of Sugar therefrom, we collect the detailed experiments of Dr. Gunst, Mr. Redman, and others; on Quartz Crushing, we offer reports of the modes adopted at the most successful mines in the neighbouring colonies, with illustrations of the machinery, and plans of the working of the veins; on Irrigation, we give the views of His Excellency Sir William Denison, and other gentlemen; on Agricultural Statistics and Cattle Feeding, &c., Sir William Denison again offers the results of his researches; and so we might proceed through many important colonial interests, concerning which we have contributions from the Rev. W. B. Clarke, F.G.S.; Captain Ward, R.E.; Christopher Rolleston, Esq.; Professor Smith and Professor Pell, Sydney University; the Rev. W. Scott, the Messrs. Shepherd, Mr. Robert Meston, Mr. W. S. Jevons, and many other gentlemen of undoubted scientific attainments. In no other form are these papers—the results of much labour and research—to be obtained. It will therefore, we trust, be acknowledged that our literary existence, should it terminate with this volume, has not been without its use.

We never indulged the hope that a publication of this character would meet with a very large circle of readers, for scientific journals, even in England, have but a limited circulation; but we confess that we did expect that the members of the two Societies, whose papers we have printed, would desire to possess the records of those bodies with

which they had associated themselves. But the constant attention to business, which is characteristic of colonial life, appears very unfriendly to the developement of a taste for science, literature, and art. We make no complaint concerning our own want of success—perchance the encouragement that has been afforded us, may be deemed by some as beyond our deserts—but we do greatly regret to see such worthy public institutions as the Agricultural and Horticultural Society and the Philosophical Society of New South Wales languishing for want of support. It is rather a reproach too that a wealthy community like this cannot hold out any hope of worthy support to even one painter, poet, sculptor, or professional literary man apart from scholastic or journalistic pursuits, and that no monthly periodical has ever yet maintained a lengthened existence in this colony. We doubt not, however, that this day of discouragement to science and literature will eventually pass away by the continued diffusion of intelligence and education, and we shall hail with pleasure the appearance of any signs of a more cordial appreciation of their blessings.

To the gentlemen who have favoured us with contributions our best thanks are due, especialy to our faithful correspondent from Magdalen College, Oxford. We also tender our thanks to the conductors of the daily journals for their kind encouragement and indulgent criticism.

One word is due on behalf of the enterprising publisher, Mr. James W. Waugh. The cost and the loss of this attempt to gather the scientific memoranda of New South Wales have been his, though we believe it is a cost he calculated on in some degree at the commencement of his undertaking, but this cost would be greatly diminished if the wealthy and intelligent colonists who have not subscribed to this magazine were now to purchase it complete in volumes. Should sufficient encouragement even now be guaranteed, the publisher is still willing to continue the issue of this periodical.

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THE

SYDNEY MAGAZINE OF SCIENCE AND ART.

VOL. II.

THE EXPERIMENTAL FARM.

THE proposition to establish an Experimental Farm in this colony has, like most new proposals, met with some opposition. We are happy to see, however, that at present the public supporters outnumber the opponents, and we congratulate the promoters of the scheme on the auspicious commencement that was made at the dinner held at the School of Arts on the 27th ultimo.

Some objections have been raised by a writer in the *Sydney Morning Herald*, under the head of "New South Wales," for whose previously published opinions on political economy we have great respect. We shall endeavour, shortly, to state his arguments, and to reply to them. We pass over the first paragraph of the letter, which we re-publish in another page, with an expression of regret that a gratuitous insinuation of sycophancy and a pretended fear of intimidation should be indulged in, where it is not attempted to be shown that either is probable. No one pretends to believe that to doubt the success of the Experimental Farm "would be regarded as akin to heresy or treason," or that it would expose the doubter to "defamation." Such fears are unworthy of so bold a writer as "New South Wales."

The writer proceeds to state, that "the establishment of model farms has been a fashionable amusement, and a rivalry among the gentry of England, ever since Prince Albert took to it; but as yet, not one of these pretty gardens, like farms, has produced any beneficial result to the public or the farmer." This is so wild and rash an assertion, that we are at a loss how it could have fallen from the pen of the writer. We would only ask him, to what other cause than to these Model Farms does he ascribe the great improvement that has taken place of late years in the farming of England? Did the abolition of the Corn Laws inform the agriculturists of Great Britain of the value of the various new manures that have been discovered? Did the importation of foreign cattle improve the breed of British stock? or, did the numerous ingenious agricultural implements that have recently been invented, owe their origin to the spontaneous demand of farmers who pursue their calling for profit?

It is not pretended, we believe, that even in England, where capital is so abundant, land so valuable, and labour so cheap, that these experiments were either originated or carried on by tenant farmers until their success had been demonstrated by wealthy amateurs. And yet we are informed broadly, that not one of these Model Farms has produced any benefit to the public or the farmer. To Prince Albert, Lord Althorp, Mr. Mechi, and a host of other devoted experimenters, the cause of agriculture is universally acknowledged to be under heavy obligation.

The writer proceeds to object that, though large and excellent crops may be raised on land that no practical farmer would attempt to cultivate, yet the means taken to produce them would render it an utterly unprofitable speculation; and he appears to fear lest our farmers should be beguiled into trying these costly modes of production.

This objection is very futile. The experience of the Model Farm, the debtor and creditor account that would of course be kept of every crop and every acre, would prevent the very wasteful expenditure that "New South Wales" seems to dread. It is almost as desirable to shew what will not pay as to recommend that which will. Supposing it to be proved, by a series of experiments conducted with great

care and every advantage that capital can give, that wheat cannot be grown on this side the Blue Mountain Range to a profit, is it not important that this should be generally known, in order that farmers may not, year after year, waste their labour and their capital on an unprofitable speculation? Is there any necessity or any probability, that farmers will imitate the Model or Experimental Farm, as we propose it should be called, in its failures? Such a course, indeed, might lead them "into the Insolvent Court."

We are not aware either that the spending of a considerable sum per acre in improvements on a farm has ever proved an unprofitable speculation. The land is not an ungrateful servant to man. Behave liberally to it and it will abundantly repay your bounty—at least, this is the opinion held by every authority we ever read, except "New South Wales," who seems to have imbibed deeply the antipodean spirit of contrariety.

We are quite willing to allow the writer the benefit of his assertion, that the Model Farm will not in itself be remunerative; but is that an argument against its establishment as a school for colonial agriculture? Do we expect our University to pay its own expenses, or our National Schools? If this argument is to have any force at all, do away, at once, with all instruction that is not presently and actually remunerative.

In the present case, the Buildings, the Machinery, the Stock, and the Work to be done, is too expensive for us to hope that private enterprise will venture on the expenditure as a matter of speculation—especially where the benefits to be derived are open to the public at large.

We have not, here, those public benefactors whose exertions and whose sacrifices "New South Wales" seems inclined to deride; we therefore believe that it is a most profitable and economical proceeding to establish a Model Farm.

The remarks of "New South Wales," however, might have had some weight if the condition of agriculture in the colony was prosperous. If our farmers were doing well, and growing more wheat and other crops than the colony could consume, if all farm produce was a drug in the market, the necessity for such an establishment would not be so apparent. But it is notorious that the contrary is the case. It is probable that in no civilized country in the world is agriculture so neglected as in New South Wales; and it is very certain, that the colony is far behind all the others of the Australian group. South Australia, with one-third of her population, produces more wheat than she can consume, and helps to feed us. California, a country of about eight years' growth, is far before New South Wales, that can number seventy summers, and sends us of her surplus agricultural productions—even to potatoes; while the poor New Zealand natives can mock our feebleness in this respect, by sending cargoes of the produce of their rudely cultivated farms. The cause of this is not difficult to discover. It is not the want of land, or the difficulty of obtaining it. There is plenty land in the hands of farmers who do not know how to cultivate it, and who are afraid of spending money and labour upon it. This, the Model Farm, would teach them.

There is, in addition, the crying evil of the want of roads, or means of internal communication. These, once made (and here, we are glad to find, we agree with "New South Wales), agriculture would awake. Without instruction she would stagger about a little at first, and fall into all manner of mistakes; but with the aid of the experience this Institution would afford, and assisted by cheap and rapid means of internal communication, New South Wales would speedily become not only a self-supporting, but an exporting agricultural State.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

SPECIAL COUNCIL MEETING.

PURSUANT TO CIRCULAR.

Held in the Society's Rooms, Tuesday, May 18, 1858.

Present:—His Excellency the Governor General, President; Messrs. P. L. C. Shepherd, J. Graham, Wm. M'Donell, F. Mitchell, Dr. Houston, W. Carron.

The President in the Chair.

Draft Petition to his Excellency the Governor General, asking the Government for assistance towards the Experimental Farm and Garden read, whereupon it was resolved, on the motion of Mr. P. L. C. Shepherd, seconded by Mr. W. Carron—

That the petition now read be adopted and submitted to the members for their signature.

Letter read from Mr. J. W. Waugh, regarding the publication of the proceedings of the Society.

Letter read from the Secretary of the Chamber of Commerce.

Resolved, that Messrs. Ottley, M'Donell, and Shepherd, be requested to inspect the room which the Secretary suggested would be suitable for office purposes and for holding the regular monthly meetings at the Sydney Exchange, and if approved by the above gentlemen the Secretary be directed to engage the same at the rate of £80 per annum.

The following gentlemen were proposed as members:—the Honorable James Martin, J. Want, Esq. Mr. Wyild, and Edwin Hickey, Esq.

Notices of vacancies in the Council having been given, the following gentlemen were proposed to fill them:— Messrs. G. Rowley, and J. G. McKean.

COUNCIL MEETING.

May 25, 1858.

PURSUANT TO CIRCULAR.

Present:—Messrs. P. L. C. Shepherd, W. S. Wale, D. McInnes, J. Graham, G. A. Bell, Dr. Houston, and W. Deane, Hon. Secretary.

Mr. P. L. C. Shepherd in the chair.

Minutes of Council Meetings, April 27, and May 18, read and confirmed.

Mr. Thornthwaits, tender for cutting a die, accepted.

Mr. Gay having reported that the tents, the property of the Society, which are now in the Botanic Gardens, are being eaten by the rats, it was resolved, that the subject of the disposal of the second sized tent be placed on the business paper for the next Council Meeting, and that Mr. Gay be communicated with to enquire if he is willing to undertake the safe custody and erection of the Society's tents at a lower rate than at present.

The members proposed at the last meeting were confirmed.

The following gentlemen were proposed as members:—Mr. John MacDonald; Mr. Arthur Hodgson; Mr. David Taylor; and Mr. J. Flavelle.

Mr. Joseph Dyer was proposed as a member of Council.

SEVENTEENTH MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange.

Tuesday, June 1st, 1858.

Members of Council present:—His Excellency the Governor General, President; the Rev. George E. Turner, Vice-President; Messrs. T. W. Shepherd, G. A. Bell, J. Graham, P. L. C. Shepherd, W. M'Donell, O. Ottley, Dr. Houston, W. Deane, Hon. Secretary; and about thirty members and their friends.

The President in the Chair.

MINUTES.

Minutes of last meeting read and confirmed.

The President stated that the Dinner had taken place under the auspices of the Society on Thursday last, when the subject of the establishment of a model Farm and Garden at Parramatta, was brought before the gentlemen present, and the sum of nearly £900 subscribed, as donations and annual subscriptions towards the furtherance of the object, and that subscription lists were in course of preparation which would be forwarded to the members, who he trusted would use their best endeavours to obtain subscriptions and donations, so that the Farm might be commenced as soon as possible.

PAPERS READ.

Paper read by the President, from Edwin Hickey, Esq., F.R.G.S. and F.A.S.—Observation on the Cultivation of the Cotton Plant in Australia.

In answer to a question from the President, with respect to the cost of labour in America, Mr. Hickey stated that every able bodied slave is worth about £35 per annum; and in answer to another question as to the quality of the land necessary for the culture of cotton, Mr. Hickey stated that it was generally poor land, and in the southern States they use a good deal of manure. Mr. Hickey also stated, that, after being picked, the cotton was allowed to remain for a few days in the sun, so as to be perfectly dry before being ginned, and that 500lbs. to the acre was considered a good crop.

The President asked what was generally done with the seed.

Mr. Hickey believed it was generally burned.

Mr. Meston stated that he had seen pigs fed with the refuse after the oil had been extracted.

It appeared, in answer to a question as to the female plant being allowed to remain, that the strongest plant had obtained the name of female from those engaged in its culture wrongly, the cotton plant belonging to the class called by botanists hermaphrodite.

Mr. O. Ottley proposed a vote of thanks to Mr. Hickey for his valuable paper, which, on being seconded by Mr. W. T. Cape, was put to the meeting by the President, and carried by acclamation.

The Secretary read a paper from R. Meston — on bones as a fertilizer of the ground.

The President stated that he had made some experiments with bone manure in Van Diemens Land, having applied it in the shape of superphosphate and found it to succeed.

Mr. Henry Waymouth mentioned that he had the honour of reading a paper a few weeks ago on bone manure before this Society, which had been written in order that attention might be drawn to the fact of the quantity of bones that are wasted in this colony, which, by conversion into superphosphate of lime, by the application of sulphuric acid, would produce an excellent manure at a small cost. Upon enquiry from Mr. Blake, he found that sulphuric acid could be obtained for 2½d per lb., which was the principal article required in the manufacturing of the superphosphate.

The President observed, that one of the great benefits to be derived by the establishment of the Model Farm, would be the application of the various kinds of manure, and proving their adaptability to this country, or otherwise, by actual experiment, the result being given to the public by means of the Press, &c., and also observed that he could testify to the good results of the application of sewer water and night soil, having had a drain made from the Infirmary to his own garden, in order that the sewerage might be used as a manure, the result was that the soil, which was of a very poor sandy nature, now produced excellent crops.

Dr. Douglass mentioned that he did not think it would pay to manure in the country parts away from towns.

The President observed that he differed from Dr. Douglass in this matter: he thought no man had a right to attempt the cultivation of a farm of one hundred acres, when he only had the means of cultivating twenty, which want of capital caused him to go on cropping year after year without the application of manure, and at last, the land being worn out, would not produce more than 12 or 15 bushels of grain to the acre.

Mr. Meston remarked, that if good farming won't pay, it is a fact that bad will not.

The President, speaking of sulphate of ammonia, said that he had made some experiments on Shooter's Hill, London, with very good results.

Mr. Waymouth spoke of the use of ammoniacal liquor as a manure, a great quantity of which was let run to waste from our gas works.

Mr. W. T. Cape wished to ask if a small work, written by Martin Doyle, for the use of the National Schools in England, on agriculture, could not be adapted to this colony.

The President thought we were not in possession of sufficient information at present for this, no doubt when the Experimental Farm was established we would be able to give our experience, which would be of use to the agriculturist.

Dr. Douglass proposed that a vote of thanks should be given to Mr. Meston for his valuable contribution on bone manures, which was seconded by Mr. J. Dyer, and carried by acclamation.

Mr. R. Meston returned thanks, observing that he was only too happy at being able to communicate anything that would be of interest to the Society.

Mr. P. L. C. Shepherd read the following extract from a letter he had received from Mr. C. H. Taylor respecting the California Prairie Grass, the seed of which he had obtained from the Society.

CALIFORNIA PRAIRIE GRASS.—We have been favoured by Mr. C. H. Taylor, of Woodforde, Magill, with plants of a new grass which he has succeeded in raising in Mr. Skelton's garden at Woodforde, from seed supplied by the Horticultural Society of Sydney. Mr Taylor sowed the seed in September last, and the grass has consequently, been exposed to the full influence of the summer heat. Some of the plants have matured their seed, and the specimens submitted to us have flowered and are in full vigour. Indeed the lively green appearance they present is quite refreshing to the eye at this dry season of the year. Mr. Taylor's experiments appear to us to have established his grass as a hardy summer plant, remarkably well adapted to our climate, and its other properties will have to be tested by further experiment. It is said that this grass may be cut three times a year, and produces seed at the rate of 168 bushels to the acre. So far as we can judge from appearances, we should take the California prairie grass to be a sweet and nutritious pasturage, and we are informed that cattle, horses, and sheep, have

proved their appreciation of its flavour by readily eating such sma l portions as Mr. Taylor could spare for the purpose of testing their appetites. There is a strong probability that this new botanical importation will prove a great boon to the colony, affording a valuable pasturage at the season when the native grasses are altogether worthless.

Woodforde, Magill, near Adelaide,
South Australia,
April 2, 1858.

Messrs. SHEPHERD and Co.

GENTLEMEN— I have much pleasure in writing you, and to inform you of my success with the California Prairie Grass. I sowed the seed last September in two seed pans, and planted out the plants, when 3 inches high, a foot apart, some on gravel, black soil, and land alone. They have all done surprisingly well without any artificial means. I have had three cuttings from some of the plants, and one now six inches high— its height before cutting was twelve inches. We have had a very hot season in South Australia to test the Prairie Grass, and I feel confident it will prove a great boon to the colony—a permanent pasture grass of superior fattening quality. I took plants of California Prairie Grass to the Office of the *Adelaide Observer*, to be commented upon. I enclose the same. You will receive a paper also. Will you be kind enough to let the Agricultural Society of Sydney see the account.

I may mention I sowed upwards of 12 kinds of British Grass last June, and all failed.

With reference to the above grass, Mr. G. A. Bell stated he thought it would produce about 14 tons to the acre.

MEMBERS CONFIRMED.

The Members proposed at the last meeting were confirmed.

MEMBER PROPOSED.

Mr. Thomas Clark.

NOTICE OF PAPERS FOR NEXT MONTH.

Mr. T. W. Shepherd, on Native Plants, and the Agriculture and Pastoral Resources of Australia.

Mr. Henry Badgery, on the Cultivation of the Potatoe.

Mr. Lewis Markham, on Meteorology.

The next monthly meeting will be held on Tuesday, July 6th.

OBSERVATIONS ON THE CULTIVATION OF THE COTTON PLANT IN AUSTRALIA.

By Mr. EDWIN HICKEY, F.R.G.S., and F.A.S., of London.

AMONG all the productions of the earth, which exercise an influence over our domestic and social comfort, and which, at the same time, has become to us an increasing want, opening to us continually new uses for its employment, there is no one article of either agriculture or commerce which has acquired the extraordinary expansion of the cotton plant. From an article of mere domestic consumption it has swollen into a national and political necessity, and now seems destined, before many years, to give a new impetus to agriculture, and to effect a most stupendous change in the productions of the earth within certain limits from the equator, and wherever nature, by the character of her soil, will permit of its successful cultivation, to displace all other productions which have hitherto proved themselves in such climates either uncongenial or unprofitable.

It is only within the last half century that the cultivation of this plant, as an export, has been introduced in the Southern States of America; but so tremendous have been the strides it has made, that they now produce annually, 3,000,000 bales of cotton, and its value is estimated at £45,000,000 sterling; and within the last century it has been increased, more or less, in Egypt, in India, in the Brazils, and in some parts of Africa. So that, at the present moment, there is considerably more cotton produced in the world than at any other period of its history.

Still, during the past ten years, the prices of raw cotton in England—where the great bulk of it is sent—have more than doubled, and the cotton planters of America are now in better circumstances than at any former time of their lives. This advance in the price has rateably increased the value of labour there, imported a new activity to cotton cultivation, and caused full many a piece of pine forest to be cleared and put under cotton, in places where the soil is wretchedly poor and uninviting, and the timber standing on it as thick as a stubble field. And this simple fact will sufficiently indicate the prodigious advantages of cotton cultivation, when such lands as these are employed to bring it forth.

With a knowledge only derived from casual observations in other countries where cotton forms an export, but without any of that minute or practical investigation so indispensable for rightly informing the judgment, *my* mind has been, for some years before my last visit to Europe, deeply impressed with a belief that cotton could be extensively and profitably cultivated in Australia, particularly in the valley of the Hunter.

In order to supply that information which I conceived I required, for a correct appreciation of such an undertaking as the culture of the cotton, I paid a visit, in the autumn of the past year, to the Southern States of America, to examine the plantations in North and South Carolina. I had the advantage of being accompanied to some of the plantations in the latter State by a very intelligent Scotch gentleman, who had been thirty years in that country, and was once himself a planter. The result of my examination and enquiries may be stated in two or three words: it was, that this country possesses such varied *natural* advantages for the growth of cotton over the State of South Carolina, that it would, at this moment, be impossible to form any opinion of their extent.

The first thing that struck me in these plantations was the great inferiority of the soil as

compared to that on which cultivation in Australia is usually carried on. Such, for example, as the alluvium in the great valleys of our rivers, and the volcanic remains on our mountain slopes. The soil *there* generally partakes of the character of a marine sand, and exhibits all the appearance of it. Harsh and hungry, it demands to be well coated with manure before any crop can be raised on it. Its primæval vegetation was the Pine Forest, with clumps of oak interspersed in the neighbourhood of streams; and the very presence of pine forests alone is sufficient to indicate to those who are familiar with them, the poverty of the soil on which they flourish. The alluvial lands of the rivers, where they *do* occur, are reserved for rice plantations.

The second advantage which we possess, but which should, perhaps, be placed first in importance, is *Climate.* The poverty of a country in its soil may at all times be enriched or improved by human industry and intelligence. It always has been so. But when we come to deal with the circumstances and effects of climate, nature has set a limit to all our operations in this way, and human efforts become powerless, except in a most limited sense.

The State of South Carolina, which produces the celebrated Sea Island Cotton, the finest and most valuable cotton in commerce, lies between the parallels of 32 and 34 of north latitude. The valley of the Hunter in this country lies in 33 south. They both lie on our eastern seaboard, and both form parts of continents. Comparing, then, their distance from the equator, and other local circumstances, any one would conclude that their climates must approximate very closely. In the intensity of summer heat they do very much, but in South Carolina there are causes at work which cut short the warmth of the autumn months by very early frosts, which are most destructive to all tropical vegetation, such as cotton, and constitute a severe scourge to the planter's crops. In this we differ essentially, as we have no frosts on our coast lands for nearly two months after them.

The immediate cause of these early frosts is the coldness derived from the great current from the Northern Ocean, which preserves its course to the south, along the whole line of the American coast as far as the Gulph of Mexico, where it serves to replace the equatorial or Gulph Stream, which thence runs north (but outside the colder stream), still it spreads itself out in the more northern Atlantic, warming and tempering the otherwise severe climate of the British Islands.

To those who are unfamiliar with such things, it may seem extraordinary that an ocean current from the icy regions should affect the climate of a country within ten degrees of the tropical line, but it is not the less a simple truth. The ocean has its peculiar climates, which exercise a most remarkable influence over the climates of the earth, in some countries moderating the intense action of the sun, and in others softening the severity of the winter. Let us look, for example, at the climate of Lower Canada, and compare it with that of the southern counties of England. In Lower Canada, in latitude 45 degrees, the cold of winter is so intense as to create a complete cessation of all industrial operations out of doors; while in England, in 51 degrees, the winter creates little or no disturbance of this nature. In the former case, the atmosphere of the icy region is brought down with the great northern current, enters the Gulph of St. Lawrence, and imparts its temperature to the whole of Lower Canada. In the latter, the influence of the warm Gulph Stream is felt to such a degree, that so late as the last winter, in the months of November and December, violets and raspberries were gathered in some of the gardens in the southern parts of England.

Again, in the north-west part of Upper Canada, in the extensive valleys of the Red-deer River, and the north and south branches of the Saskatihawan, between the parallels of 50 and 60 degrees north, but at a distance of upwards of 2000 miles from the Atlantic Coast, the cattle are said to keep fat all the winter—and that territory has a mean winter temperature not exceeding that of New York in 41 degrees; but the latter being on the coast is also affected by the cold of the northern current.

The eastern coast of Australia, on the contrary, is washed by the warm equatorial current of the Pacific, which, rising in the Gulph of Panama, one branch of it spreads itself out to the south and west till it meets the shores of Australia, and then turns to the south along its eastern coast. To replace this warm current a colder one is running from the Southern Ocean to the north, along the western coast of America. It is this warm current of the Pacific, lying along our shores, which renders the atmosphere of the sea warmer in winter than that of the land, and hence our strong westerly or land winds of winter—and hence the mildness of our autumn months, and our long absence from frosts.

As a striking, but simple exemplification, of the mildness of our winters, as compared to several parallels of latitude in the Southern States of America, I may mention that *they* cannot grow the orange further than 28 or 29 degrees from the equator, while we grow it in Australia to perfection as far as 35 degrees south. Where *their* finest cotton is grown, the orange will not grow at all. Both plants thrive better near the coast, because they both derive material advantage from the sea air.

These are things, however, very generally understood, but were they not so, in a Paper of this character, I could do nothing more than to allude to this system of marine climates, which the investigation of recent times has found to exist, and which must necessarilly be most comprehensive in its nature, and most difficult to curtail in its illustration. But any one who may feel interested in such a subject, will find it most beautifully and carefully treated in Maury's "Physical Geography of the Sea."

Enough, however, has perhaps been said on this point, to shew that we possess materially in our favour the two most important elements in the cultivation of cotton—namely the soil and climate. And, I think, at this moment, we cannot venture to estimate the enormous advantages which *may* be derived from these two facts. The luxuriant richness of our alluvial soil will yield us a much fuller crop than that obtained from the sandy soil of South Carolina, besides saving to us a cost of about five pounds an acre for manure. And the mildness and warmth of our Autumn will cause our cotton plants to produce

pods for two months later than the climate of the Southern States. Both these causes must tend to increase our crops of cotton, and proportionably to make its cultivation more profitable to us.

Then comes the question of *labour*, which fortunately is one quite within the limits of human control, and therefore one with which we need not be afraid to grapple. I am fully aware that this will be urged by some, who have not fully considered the subject, as a difficulty with which all must contend, who attempt to cultivate cotton in this country. But I trust I shall be able to shew, from an attentive consideration of the question, both here and in the United States, that labour presents no serious obstacle whatever. It is true we have no *slave* labour, nor do I believe that an acquaintance with its peculiar character would establish in any one a predelection to enploy it. In rice plantations the labour of the African, from his peculiar constitution in resisting fever, is indispensable—in cotton plantations I think European labour and intelligence infinitely surpass it.

In slave plantations, as a general rule, the employment of machinery for the purposes of agriculture is hardly known, all things seem carried out and performed by the hand—even, in most cases to the working of the cotton gins for removing the seeds from the cotton. This *may* arise from the presence of abundant labour; but whether it does come from that cause or not, it is unimportant here to enquire. The fact is undisputed. While in the Free States, the employment of machinery to *all* agricultural operations, is far more general among them than in any part of Europe.

This peculiar difference between the Slave and Free States, blended with the very small amount of work performed by the slaves, has led to the opinion, now so common in America, that slave labour is the most expensive of all, and, at the present day, many cultivators of the soil in Virginia, Maryland, and Kentucky, acting on this belief, and looking also at the extraordinary progress made by the Free beyond the Slave States, have put away their slaves to employ free labour.

In cotton culture in this country, a great advantage in the way of labour will be derived from the employment of families, because children and women are nearly as serviceable as men in gathering the cotton, thinning out the plants, and other manipulations of the produce—and this source of employment must necessarily constitute a support to a large rural population, more so indeed than any cultivation in the world. And, whenever a profitable employment of this character offers itself, thousands will be found to follow after it. The class known as little settlers and their families, are the people singularly adapted for cotton growing; and I think a system of payment to these people for their labour, by giving them a share of the crop, where a landed proprietor farms the land himself, and apportioning to each family a certain number of acres, would be found to work admirably with them. It would establish in them an interest for the success of the crop, and lessen the trouble of superintendence. It would also release the families from the responsibility of rent, to which they are now liable as tenants, and the employer from great anxiety as to labour.

If, however, the demand for labour in cotton growing could not be fully met in this way, there is surely no difficulty in importing it to any amount commensurate with the profits of the cultivation. I cannot for a moment conceive that the want of labour can ever form an objection to cotton cultivation.

Next to the item of labour, in South Carolina, comes the expenses of *manure*. This with them is a very serious affair, because their soil being of the nature I have already described, requires to be well covered with manure to produce a crop. It is difficult to estimate its true expense to the planter, but from all I could learn I should think it could not be under five pounds an acre. The manure is made by cutting rushes and other litter from swamps, by digging the soil from the beds of swamps, and by putting the whole into large pig yards to form a compost with the soil of the yard, a great many pigs being kept for feeding the slaves.

In growing cotton in this country on the alluvium of our rivers, the manure is an item we can dispense with altogether, the soil being if anything too rich. And although in many places long cultivated for grain, to this plant it must prove itself a virgin soil, as none of the elements required for its growth have ever been taken from it. This is an advantage to us of no ordinary kind, because I apprehend the cost of manure to be nearly equal to the cost of working and cleaning the land till the cotton is fit to pull.

Thus we see, up to this point, a few of the features in the cultivation of the cotton plant which are more favourable to us in Australia, than to the southern states of America. Let us now see why the adoption of a new cultivation among ourselves, in the valley of the Hunter, and on all such rivers to the north, becomes not only desirable, but absolutely necessary, apart from all considerations of comparison with other countries.

No one who cultivates the lands of these rivers requires now to be told of the uncertain results of a wheat crop, of the disastrous effects of the blight and rust on the wheat, or of the destruction of the caterpillar; for it is hardly too much to assert that, on an average of years, the crops of this grain will not do more than pay for the seed, labour, and rent of the lands. The profits from farming, where they do arise, are derived from other things; wheat, however, has hitherto been the standard crop—that on which the main dependence of the farmer has been placed, and that for which the greatest efforts in preparing his lands have been exerted. No doubt these efforts in this country are often very far short of what they should be, still, where they have been most perfect, the results have been equally uncertain, and I now feel persuaded that the longer this uncongenial cultivation is contiuued, the longer will the prosperity of these districts be retarded.

It is a curious fact, that the State of South Carolina, now so justly and pre-eminently distinguished for the excellence of its cotton, was once a *wheat* growing State, some forty years ago, but the farmers finding they could not compete with the northern and western states, abandoned that cultivation entirely for cotton and rice, but chiefly the former; and at the present moment there is not in the whole Union, a State in a more flourishing condition: this has been the result of their change from wheat to cotton. It was found in

that climate as uncertain and as unprofitable as it is here, although they had the advantage of being protected from foreign grain by an import duty of thirty per cent.

And this brings before us another consideration for the abandonment of wheat: when the farmers of this country *do* get good crops, their prospects are checked by the presence of foreign grain and flour, which may be shipped in Chili, at the other side of the Pacific, at about 2s. 6d. or 3s. a bushel, and any quantity can be raised and sent over. The importer of foreign grain here pays no duty, it is as free to enter Port Jackson as the grain of the Hunter. In Chili, labour is not only abundant, but cheap to excess, an agricultural labourer getting usually about 6d. a day, and feeds himself out of that. The land of their plains is good, and their means of irrigation, in dry seasons, from the streams of the Andes, the finest in the world. In a word, with this unequal competition before them, the wheat growers in this country never can be certain of a profitable market for their grain—they have indeed no market whatever.

Let us see how it would be with the cotton. We need not fear being undersold or baffled in this when the crop is gathered, for, like our wool, it is money at once to the grower. The market is not only unlimited, but England is *craving* for it, and is willing to pay for it the highest price in the world. With such an alternative we need not lament that our wheat crops disappoint us. It is we who are at fault in having continued them so long. Wheat, in the places I have indicated, is highly uncongenial, and has long been known to be so; and it is now full time that we adopted only that cultivation which nature in her munificent distribution of her soil and climate has designed that we should follow.

To the landed proprietor especially, nothing is more important than growing only on his property that which will command an immediate market at a minimum price. Produce of this character fixes the value of landed estates, and facilitates all transactions in letting or selling properties. In the southern States of America, for example, the value of a cotton or rice plantation is known at once by its produce—that is, what its crops of either one or the other have previously realized in the English market. The cost of production and superintendence are also known, and this determines the value of the property. This is precisely the case, too, with all large vineyard estates in France, where their wines have acquired a character and price in the market.

As regards the character of the cotton which Australia can produce, I am much gratified in being able to exhibit a report, with samples, from Messrs. Hollinshead, Tetley, and Co. of Liverpool, the first brokers in England—indeed, in the world, which was obtained for me by Messrs. Tetley and Son, of Mincing Lane, London.

COPY OF REPORT ON AUSTRALIAN COTTON.

Liverpool, 23rd January, 1854.

Messrs. Jn. Tetley & Son, London.

Gentlemen—We have carefully examined the sample of Australian cotton sent us for valuation.

It ranks with the highest class of Sea Island Cotton, and, free from the few spots of stain, is worth 3s. per lb. in this market.

It is superior in fineness and evenness of staple, though a little inferior in strength of staple, as compared with Sea Island.

We return you the sample, as you may not have retained any, and send you a small bit of Sea Island, worth, to-day, 2s. 6d. per lb., and another purchased to-day at 2s. 9d., both inferior to your sample, in our opinion, and in the opinion of the buyer of the 2s. 9d. lot.

Your obedient Servant,

(Signed) HOLLINSHEAD, TETLEY, & Co.

The celebrated Sea Island Cotton, alluded to in the preceding Report, is grown on the lands within a short distance of the coast, and the islands lying along the shores of South Carolina and Georgia. Hitherto this has been regarded as the finest cotton imported into England, but I am glad to say, there are strong grounds for believing that Australia is destined to surpass it in quality. Such, indeed, is the opinion of the manufacturers of Manchester.

During my stay in the Southern States, I made arrangements for six bushels of the Sea Island seed, of the last crop, to be shipped for me direct to Sydney; and I am now in daily expectation of receiving the same. I also expect, through the kindness of Thomas Bayley, Esq., of Manchester, a large quantity of similar seed, and of the New Orleans seed also, which Mr. Bayley recommends particularly for growth in Australia.

So convinced am I of the eventual success of the cotton plant in this country, that it is my intention to commence its cultivation in the Lower Hunter in September next. And I propose to try the Sea Island, the New Orleans, and that now used at Moreton Bay, and to continue that which will yield the longest and finest staple.

The manner of cultivation is most simple, not indeed unlike maize. About half a bushel of seed is required for an acre of land; drills are drawn about five feet apart, and the seeds are put into holes in the drills at about 18 inches to 2 feet apart, according to the strength of the soil. About eight seeds are put into a hole, and they are afterwards, when above ground, thinned to one plant for each—that one plant to be what is called in the States a "*female*"—to be known by its leaf. The land must be well cleaned and prepared, and the plants when young kept very clean. The crop would be gathered in the months of March, April, May, and June, or as long as the frosts keep off.

Overseers for cotton plantations can readily be obtained from the Southern States of America, who thoroughly understand their work, and no doubt many may be found in this country already.

The great disproportion now felt in England between the supply of cotton and the present wonderful demand throughout the world for the manufactured article, has began to awaken a most extraordinary alarm in Manchester, Glasgow, and other places; and which is certainly not likely to be diminished by the present aspect of things in the United States, where every year additional mills are being constructed for the manufacture of the raw material. The advantages to the manufacturer *there* are enormous. The cotton on the spot, and a protective duty of thirty per cent. on English fabrics of that material. It is not surprising that English manufacturers feel that the supply of cotton from the

States may become less every year, from that cause alone; till, in the end, America may rival England in what is now the greatest item of commerce in the world. There are also *political* fears as to the failure of the supply of cotton, which are more acutely felt, though less loudly expressed. They come from the knowledge that we are dependent for it on a foreign power, and that power more jealous than all others of England's greatness. A spark of difference may at any day cut of all intercourse between the two countries, and thus prostrate at home the employment of some hundreds of thousands, whose voice would be heard from one end of England to the other. To turn Australia, therefore, into a cotton country, would be hailed by the manufacturers of England with acclamations of joy.

As an indication of this alarm, I subjoin an extract from a leading article of a late number of *The Times*:—

"It is extremely interesting—unless, indeed, a term expressive of some deeper emotion should be employed—to remark the views and proceedings of the manufacturing world at this moment, with regard to the cotton supply. This plant is now considered, and with perfect reason, as one of the chief elements in the wealth of nations. The mutinies in India set the French journals speculating the other day on the effects producible in the cotton market by the interruption of cultivation in Bahar, the Americans are seriously apprehensive of being overtaken by the excessive demands of Europe, and our own manufacturers have found associations and established correspondents for the purpose of seeking out this precious material in all parts of the world. There is no delusion or mania about all this. What bread is to life cotton is to commerce, for raiment comes next in necessity to food. Wool was once the great staple of this country, but wool now gives place to the produce of the cotton plant. On this produce depend our manufactures, and upon our manufactures depend our inexhaustible resources and our national power.

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"It appears to us, that if one America is not sufficient, and we want a second, we can hardly do better than take the first for our model. We know of scores of spots where the soil and the climate are as good as in Georgia, and though, perhaps, cotton of the very best quality is not to be raised everywhere, or upon the instant, we have great faith in the powers of cultivation. But soil and climate are not enough. Capital, energy, and organization will be called for still, or we shall get no cotton to speak of, and it happens that in none of the countries otherwise fitted for the purposes in question are these requisites to be found among the native possessions. The qualities which enable Americans to send out millions of bales every year are not discoverable in Hindoos or Borneans, and as they are not indigenous they must needs be imported. England, in short, must find money, machinery, and wits, and if these are carried to some well selected territory, where there is good land and abundant labour, we may soon be able to dismiss our alarms about the production of cotton."

If the *present* condition of the cotton market in England can elicit such observations as the above, from the leading journal in the world, what are we to contemplate as the result of the opening of the whole of the Chinese ports to our commerce, and the probable prodigous demand for our cotton manufactures which must follow a more enlarged intercourse with that country—supposing that demand to be at all commensurate with its dense population. It *can* have but one tendency—to increase the demand for cotton, and render more brilliant still the prospects of all who now undertake its cultivation. At no period of the world has there been a more propitious time to commence the growth of it. Australia has merely to strike out, and I feel persuaded she will, before many years, establish for herself in Europe a name equal to that which the unrivalled quality of her fleece has placed on her brow; and which has so conspicuously contributed to render England independent of the whole world beside, for the supply of the finest merino wool.

ON THE APPLICATION OF BONES AS A FERTILIZER OF THE GROUND.

"Quid faciat segetes lætas?"—Virg.

In a country with so much poor soil, methinks the use of manures would, or should, form a subject of no secondary importance to Australians. In no colony are manures considered of less value. They are wasted, thrown away, neglected, in hundreds, thousands of tons annually—folks quite forgetting the old farming adage, "*sine stercore—nil*" or no manure, no crops. While in Britain, bones, guano, and various other et ceteras, are imported from the *ends* of the earth, or the farthest parts thereof, the Australians rather import 836,000 bushels of wheat—as in 1855 alone, than apply the stores of their own colony, whether on bones, city or town debris—remains of boiling down establishments, or various other excreta, either for raising crops, or disposal to the more industrious as a mercantile commodity. They contain the principia of corn. From amongst them bones form, at present, the text for our paper. Eight years ago, Mr. Wilson erected a bone-crushing machine in Sydney, but his best customers were the Tasmanians. His scale of support might be aptly rendered by the three degrees of comparison—parvus, minor, minimus—and the business was given up. Now, however, when guano gets scarcer, and in time may be exhausted, it might be worth while, if colonial attention was turned to the serious consideration of our own resources, in this and numerous other ways and means of advancing our own interests. I was one among the first to use bones as an auxiliary to raise heavier crops of turnips in Aberdeenshire. They have, since that time, maintained a constant demand in a county which raises more green crops and fat cattle than any other in Scotland.

The bones of domesticated animals differ very little in composition from one another; they consist of about $\frac{1}{3}$ gelatine, or organic animal matter; $\frac{1}{2}\frac{1}{0}$ phosphate of lime; and about three per cent. each of phosphate of magnesia, carbonate of lime, muriate of soda; with a little chloride of calcium.

The organic part consists of carbon, $\frac{1}{2}$; oxygen, $\frac{1}{4}$; *nitrogen*, nearly $\frac{1}{8}$; and of hydrogen, six or seven per cent.

When bones are burned in open fires, or steamed down until friable, they lose half their weight; the organic matter is discharged, and white bone earth only remains. Here, those who choose to manufacture the superphosphates, or rather, bi-phosphates, find the bones for their operations. As a practical farmer, I, with many others of the same stamp, cannot fall in and adopt the Liebig theory, which boldly pronounced that the value of bones as a fertilizer solely depended on the earthy phosphates. At times, theory gallops a-head of practice; but in the long run, practice beats him. From a multitude of experiments, it has been found that *calcined bones* applied alone, and in quantity equivalent, do not always succeed in producing a crop.

Unburned bones seldom fail in raising an average return of turnips or other green crops.

On some soils, burnt bones have actually forced a larger crop than their equivalent of green bones. The corollaries deduced may be thus expressed: uncalcined bones always make the surer and more permanent manure. Should the soil already contain a sufficient quantity of organic matter, the superphosphates will be sufficient; or a combination with farm-yard manure will effect a compensation; even should the soil be destitute of animal remains or nitrogen, bi-phosphates, whether used in the liquid or in the dry way, are excellent for growing or forcing one crop, but their virtues do not last; and, in their effects, a little credit is due to the sulphuric acid by which the bones have been dissolved. Let the advocates of bi-phosphates inquire into the relative compositions of bones and guano, so lauded; they will find that the chief worth of guano depends on its proportion of $\frac{1}{10}$ of organic animal matter in a very decomposed state; and a very slight knowledge of chemistry can supply the place of one by the use of the other. Also, weight for weight, bones ought to go farther and last longer, than the best Ichaboe guano, and, item, it must create surprise at the fact that guano is imported (I have heard) into Sydney, and made use of as a manure in the face of this truth: thus, antipodean-like, carrying coals to Newcastle.

Nor ought we to doubt the super-value of fresh bones in a common sense view. All their substances are derived from vegetable food. They must, therefore, exist in all nutritive plants. These, however, receive them from the soil or gaseous evolutions from thence proceeding. If not in the ground, then, the soil is poor, and the worth of *bone dust* is invaluable as a manure and top-dressing to all grass lands. Besides, the gelatine of bone is beneficial to all poor lands devoid of humin, or to fields over-cropped, or gardens over-wrought. The nitrogen converted into ammonia, or its compounds, becomes fresh food for vegetation; and the Australians, who burn bones for bi-phoshates, will one day eventually get burnt themselves, in the consideration of £. s. d., minus profitable returns for cost and trouble. One hundred pounds of dry bone contains gelatine sufficient, says Liebig, to produce 6½ lbs. of ammonia, independent of carbon and carbonic acid; and part of the nitrogen, probably, is taken up, without decomposition. The main differences betwixt bones and guano depend on their constitutions when about to be used. Guano is, in a great measure, decomposed; bones, in an opposite condition. The soluble salts in guano are readily taken up by water, and at once conveyed to the absorbent roots of plants. With green bones, the gelatine is scarcely soluble in cold water. The organic prevents decomposition and post combinations of the inorganic; and hence, the action from bones are slow—from guano, quick; and the method of solution by sulphuric acid has been scientifically introduced, to render the action of bones as speedy as the action of guano. "Wanted, a cheap, easy, and effective mode of semi-decomposition, whereby green bones can be readily converted into an efficient and active manure at the first application."

The value of bones utterly neglected in this colony, is not easily computed. If Mr. Hutchinson's estimate, that £150,000 expended in bones imported into Britain, was capable of raising 500,000 quarters of grain, then the loss to Australia must be serious in its despised bone alone. The census returns of 1856 gives a population of nearly 287,000 individuals. These, at an average of ten pounds of meat a-piece, consume 2,870,000 lbs.; deduct one-tenth for bone, and we have 25,620 cwt. of bone.

In the same year were melted down, 266,700 sheep at, say fifty pounds each; and 45,239 cattle at, say 600 lbs. each—equal to 36,479,700 lbs. Subtract for bone, one-tenth, and we have 22,440 cwt. of bone, which, added to 25,620, gives 2903 tons; or, as the estimate of one-tenth is rather low, close up 60,000 cwt. of bone—value in Britain, £6000, or thereby. Here, we have a tidy quantity of bones which, by a little industry, might be converted into corn as food to man and beast, besides fertilizing the soil, all—all—lost; and immense masses of animal muscle, after the fat has been extracted, uttterly—utterly—let go to waste; worth—say some of you, what it ought to be worth. It is enormous to think of our reckless indifference to these matters. No kind of manures require less labour than bones—labour, the bogie at which so many get startled; whereas, were it not for the gold-diggings, labourers in this present year would be superabundant. But we have another covert reason under this cloak or cuckoo-cry of "Oh, labour—the cost of labour!" which belongs not, however, immediately to this subject of Bone Manure—although it comes home directly to the bone of the matter.

While advocating the cause of bones as a fertilizer of the soil, under a moderate degree of fermentation, I must add another favourable property admirably suited for the generally dry climatology of Australia. Semi-decomposed crushed bones (not bone dust) are excellent absorbers and eke retainers of moisture. This quality, unnoticed by bone commentators, I can manfully aver. It is a beautiful arrangement of nature, the close relation between every two products whose presence are necessary for one another; and this example is a satisfactory proof of an interesting fact.

But in all right and reason, it is only fair to state the advantages of bi-phosphates.

1st. The sulphuric acid itself is required by plants. Sulphur is universally present, and in no product more abundant that in the wool of sheep. The leaves of both turnips and potatoes contain sulphuric acid.

2nd. The application of sulphuric acid to calcined bones dissolves their substance with strong effervescence.

Decomposition arising, new compounds are formed, easily soluble by water. In the carbonates of bone, the carbonic acid is expelled, and sulphate of lime or gypsum is formed, other changes ensue, until we have got superphosphates of lime and magnesia, with small portions of sulphur and phosphate of soda, all ready for immediate service, and so, speedily exhausted. One remarkable trait is observable in the reports of bi-phosphate trials. While we hear wonders of their potency to raise *one* crop, yet nothing is said of the like effects in subsequent or crops following. No, not to be expected. If we can carry out as much manure in our waiscoat pockets as will fertilize an acre (in idea,) we may only reasonably anticipate to take back the produce in our coat pockets, and this super-stimulating of overwrought soils will one day exhaust the patent.

Moreover, inorganic portions of bones are not alone the sole support of vegetation. The permanent effect of a field is to be estimated by the quantity and quality of inorganic matter the soil contains, and the nature and bulk of manure laid on and of crop carried off. Humin every good farmer considers necessary to form a fertile soil, and its capability of absorbing hydrogen is not the least of its good qualities. The necessity of nitrogen has been already noticed. Potash and soluble silica in cereal crops form material requirements. If, by judicious rotations, the inorganic pabulum carried away by one crop is restored by other crops, the soil will retain its fertility; but if the bulk abstracted from the soil exceeds the quantity replaced by whatever way, a gradual diminution of produce certainly ensues, until at last the land lies useless, like the tobacco grounds of Maryland, Old Virginia, and North Carolina.

If any other gentlemen want super-manures, why, plenty of old boots, shoes, damaged wool, old clothes and rags, hair and hoofs, tanners dressings, &c., might be collected, and by treating these apparently heterogeneous collections to a *quantum suff.* of sulphuric acid—presto, they marvellously become converted into one mess, and a capital mess it forms for an active manure.

Regarding the refuse of sugar works: if they are mixed up with alkalies and left for some time in contact, important changes ensue. The heap becomes carbonated, and any saccharine matter which may be present is converted into gums. Much of the value of this compost will depend on whether the charcoal has been made from animal or vegetable substances.

It is pleasant for a member, 400 miles from Sydney, to find a spirit of enquiry and of practical improvement stimulating the working committee and members present at the meetings of your Society. Such enquiries also set other men's minds working, and thinking, and studying, and recollecting, and helps to rub the rust off the metal of *old hands*, perhaps like myself, who have forgotten more learning than they can now remember.

The process of fermenting bones in order to hasten their decomposition is left open for the avowed purpose of hearing the ideas of others on this important subject. Let them go to work as all experimentalists have done and must do. Wisdom thus obtained becomes of much higher value to the finder as well as far more honourable than the acquirement of labour by others. Such discoveries may ultimately redound to the credit of skilful experimentalists and lead to important results for the prosperity of this colony. To draw public attention makes a right beginning—keep the steam up.

I cannot close this Paper, however, which is written as a *feeler*, without expressing a hope that, now when the subject is introduced, it will not be allowed to slumber or sleep; and shall conclude with this remark, that the action of bones is hastened by increase of temperature; and, whereas said fertilizer is most beneficial to some soils, it may be pronounced as thrown away on others. Britain and Australia are nearly antipodean. Although under mild British rule, we must be governed by our own laws both in jurisprudence and agriculture.

R. MESTON.

PROCEEDINGS OF THE PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

THE following Paper, by Lieutenant Vigors, on Pavements and Street Surfaces, was read before this Society, on Wednesday, 10th June, 1857. The subject on which it treats, occupies at the present time so much of the public attention, that we propose to print it entire. It will be found to contain a very concise history of this important branch of engineering science. Many of our readers, who suffer daily from the wretched condition of our city and country thoroughfares, will read it with interest, in the hope of gaining some hints for relief. We cannot say that we coincide with the recommendation that the author makes in the conclusion, as to the employment of wood pavements in this colony; but the large amount of information contained in the paper will, we doubt not, prove very acceptable to many readers.

PAVEMENTS AND STREET SURFACES, &c.

IN introducing the subject of this Paper, I trust it may not be considered irrelevant to refer to former ages (when nations now inhabiting the world and filling it with their glory, either did not exist, or were only in their infancy), to shew the magnitude of works designed and executed then, and many of which remain even to the present day, though their originators have long since disappeared from the face of the earth, and their names are only preserved in history.

Road and street surfaces have been formed in various ways, such as small broken stones, rubble stone pavements, ashlar, or cut stone pavements, wood pavements of various descriptions, and

wheeltracks of cut stone or iron; each of these has been especially applicable to certain situations, and their use has been regulated by certain ruling circumstances.

In tracing the history of paved roads, the Carthagenians (according to Isidore) I find, are said to be the first who paved their public ways, but pavement appears to have been previously used by the Persians.

The mighty paved roads of the Incas of Peru, remains of which still exist, may probably be considered as the earliest pavements.

The Romans suppassed all other nations in their paved roads. In Italy alone, they are said to have formed above 14,000 miles of roads, connecting the great cities of their Empire, and many of these still remain as the modern routes of travellers, shewing the immense labour and great attention expended in their construction.

Twelve great roads diverged from ancient Rome, and twelve others branched off from them. The Romans travelled to the sea by the Ostian Road, along the sea shore to the north-west, by the Aurelian, and to the south-west by the Appian. Then, there were the Flaminian, the Salarian, the Nomentanian, the Tibertine, the Prenestine, and the Latin.

Their roadways were formed in four strata in the following order:—

1st. The Statumen or foundation, where all soft matter was removed.

2nd. Ruderatio, composed of broken tiles, &c., set in cement.

3rdly. The Nucleus, being a bed of mortar, and

4thly. The Summa Crusta, or outer coat, composed of bricks or stones.

Near Rome, granite was used, in other places hard lava, beautifully jointed.

There was an office of great dignity, held by a *curator viarum*, or superintendent of ways, and this office was first held by Julius Cæsar, and was afterwards rarely conferred upon any but men of consular dignity. Tetullus had charge of the Æmilian way, and the Emperor Domitian appointed one of the pretorian order *(Victorius Marcellus)* to the charge of the *Via Latina*.

The Appian Way was the most celebrated of the Roman roads, it was called the queen of the Roman ways; it was made about 311 years before the birth of our Saviour, and first extended only as far as Capua, but was subsequently carried to Beneventum (by Julius Cæsar), and finally to Brundusium, a distance of about 350 miles. This road was said to be so good, that in the 6th century a traveller might go from Rome to Capua in five days.

The amusing description given by Horace, in his fifth Satire (1st book), of his journey from Rome to Bundusium, is no doubt familiar to many who are present. This road is also well known to modern tourists. Parts of it are said to exist at Fondi and Mola, which shew but few traces of wear or decay, even after a lapse of 2000 years! It was paved with large stones carefully jointed, and is said to have had a foot-pavement on each side; the stones used in the formation were conveyed from some distant quarry, as no suitable materials existed in its vicinity.

The breadth of the Appian Way, paved, was from 18 to 22 feet, but this, probably, like some of the other great roads, had an unpaved space of 10 or 12 feet on each side.

Twenty-nine of these great (military) roads are said to have been formed, and upwards of 40,000 miles of roads to have been made by this wonderful people.

The Greeks used squared stones for their pavements, whilst the Romans mostly used irregular polygons; the former nation are said to have greatly neglected, not only their roads, but also their sewers and aquaducts.

The roads of France were paved, as the ancient Roman roads, and remains of them still exist; they also had their sides formed with broken stones, prior to the adoption of that system in England.

The Roads of Germany and Prussia resemble those of France, but in Holland and Belgium, thin bricks, like tiles, form the surface, and under light traffic make very pleasant carriage way.

The roads of Great Britain are not supposed to have been available for wheeled carriages prior to its occupation by the Romans. But in Ireland they are believed to be of a yet earlier date, and connected with the ancient Round Towers of that country, whose history is enveloped in remote obscurity.

Near Chester some remains of these old pavements still remain; perhaps, that of the Foss-way, which extended from Devonshire to Scotland; or Ikinild-street, which went from Southampton to Newcastle-on-Tyne. Also, near Cirencester, the pavement is found; and a considerable portion of the modern Holyhead Road from St. Albans to Weedon Beck occupies the site of the ancient Watling-street, which passed Wibtoft near Lutterworth, where it intersected the great Foss Way leading to Lincoln and York.

Two years ago, some ancient Roman pavement was discovered in Broad-street, London, 1700 years old. A coin of Hadrian, who died A.D. 138, was found lying on this pavement.

Of modern pavements, the oldest is generally ascribed to Paris; but it is certain that Cordova, in Spain, was paved as early as the middle of the 9th century, or about the year 850; and the same Prince who caused this improvement, also had water conveyed into his capital in leaden pipes."

The capital of France was not paved in the 12th century, as appears by the account of Rigord (the physician and historian of Philip II.), who relates, that "the King, standing one day at a window of the palace, near the Seine, and observing that the carriages which passed threw up the dirt in such a manner that it produced a most offensive stench, his Majesty resolved to remedy this intolerable nuisance, by causing the streets to be paved, which was accordingly done, notwithstanding the heavy expense, which had prevented his predecessors from introducing the same experiments. The orders were issued in 1184, when the name was also changed to 'Paris,' from its former name, 'Lutidia' (on account of its dirt)."

A hundred years after, it was proposed to extend the pavement without the gate of Saint Martin; but in 1641, many of the streets still remained unpaved.

Dijon, one of the most beautiful towns of France at that time, had paved streets as early as

1391; and historians remarked, that after the streets were paved at this period, dangerous diseases, such as dysentry, spotted fever, and others, became less frequent.

That the streets of London were not paved at the end of the 11th century, is asserted by all historians; but the exact date of the first introduction of pavement into London is uncertain.

Several of the principal streets (as Holborn) were paved for the first time in 1417, by royal command.*

In the King's Order it was said,—"That the highway named Holbourne, in London, was so deep and miry, that perils and hazards were frequently occasioned as well to the King's carriages passing that way as to those of his subjects; he therefore ordained two vessels, each of 20 tons burthen, to be employed at his own expense, for bringing stones for paving and repairing the same."

And again, in Henry the Eighth's reign, when other streets were paved, they were described in the Order as "very foul and full of pits and sloughs, and very perilous and noyous (noisome), as well for the King's subjects on horseback, as on post and with carriage."

Smithfield Market was first paved in 1614.

I shall now proceed to consider the relative advantages and defects of each system of pavement, and will commence with STONE.

Rubble-stone pavement is made with gravel blocks, somewhat resembling a large egg, about 10 inches in length by 4 in breadth, set on end in a bed of coarse sand about 3 inches thick, into which they should be driven by a maul about 70 lbs. weight, worked by two men. The stones should be coated over with a layer of fine gravel or sand.

This sort of pavement, at home (where the stones can be easily procured), is said to have cost only from 6d. to 10d. per square yard. A good pavior will set 3¼ square yards in an hour, with four labourers to prepare the ground and ram the paving.

This description of pavement, I think, cannot be considered desirable, generally, for streets.

Cut stone or ashlar pavements are formed of hewn blocks, generally parallelopipeds, different sizes being recommended by different writers; one recommends blocks 8 to 10 inches deep by 8 wide and 18 long. Brees recommends stone 8 to 12 inches long, 5 to 7 wide, and 12 deep; while Mr. Telford advocates blocks 8 to 15 inches deep, 15 to 18 in length, and only 3 or 4 inches wide; as, he says, experience has proved that narrow stones are the best. The same author says, the stones should be laid from the sides towards the centre, as in the arch of a bridge; and the keystone, being tightly fitted in, they should be well rammed.

The practice of laying new pavement on the old has been done in Paris with good results. The old pavement was first repaired in such parts as required it.

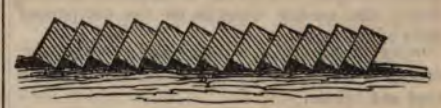
Mr. Telford recommends the under surface (where no old pavement exists) to be formed as if for a macadamized road, and, when perfectly solid—from some months' use—then, for the pavement to be laid. Concrete may also be used in soft ground with the greatest possible advantage.

In streets having a considerable elevation, several methods have been adopted to prevent horses from slipping on stone pavements; one was, to insert slate, of about an inch in thickness, between the rows of stones, forming grooves between the blocks, sufficient to prevent the horses from slipping. This system was adopted in Southwark—thus:—

Fig. 1.

Another system consists in laying the stones at an angle on their beds, thus:—

Fig. 2.



so as to form a series of steps to catch the horses' feet. This method was tried in Holborn, but the dreadful noise occasioned by the carriages passing over the edges of the stones, caused it to abandoned.

The edges of the stones, except in the last system, should be chamfered.

Ashlar pavements, of granite blocks, are much approved of by many authorities; but these have the same defect as wood—in some, becoming slippery, and the noise of them is intolerable—where the streets are narrow especially. Welsh pavement was declared to be so, in Sheffield, some years ago; and shopkeepers were often obliged to close their doors to hear their customers speak.

The system latterly adopted, of laying down the stones in diagonal lines, is considered an improvement.

The modern stone pavement between Cologne and Brussels is said to be very perfect; but this is an exception to the general character of the roads in that part of Europe; though Napoleon is said to have done more in road making, in proportion to the length of his reign, than all the Apii and Flaminii of antiquity.

In Florence, the whole breadth of the street was paved with flagstones, placed diagonally; and in Naples the surfaces are so smooth, that they are said to require to be frequently roughened with chisels, to prevent the horses slipping.

In Milan, rough stone or pitch and flag paving have been used, and the former has also been tried in the West of England; but in none of the cities of Italy I have named is there the same heavy description of traffic which we see in our large English towns.

At Pompeii, the wheel tracks are found worn half-way through the blocks of ancient pavement.

I find, that diagonal stone pavements, furrowed transversely, was successfully employed long prior to 1824 in the streets of Florence, Pisa, Leghorn, and other cities of Turkey; and in Vienna, the streets were uniformly paved in the diagonal manner, and were found to succeed

admirably, and quite superseded the old rectangular system.

In considering the subject of stone pavement, it becomes especially necessary to be acquainted with the characteristics of the stone proposed to be used.

To ascertain their absolute and relative strength, the resistance they offer to being crushed, the changes they undergo from the effects of the weather—rain, frost, snow, &c.—in order to enable one to form a correct judgment on the advantages of the use of any particular one, the expense of their preparation, and the facility of procuring them in sufficient quantity, and at a reasonable price, must also be taken into consideration.

Silicious stones, granite, gneiss, and sienite, which are sometimes classed under the general head of granite, may be placed first on the list of stones fit for pavement: they are composed of quartz, felspar, and mica, in different proportions; the quality depends on the component parts of the stone.

Thus, if the quartz predominates—and particularly if its grains are large—the stone will be hard and brittle.

Much felspar is objectionable, as it decomposes after long exposure to the atmosphere; and mica is also subject to the same defect; and, when in excess, weakens the stone.

The sulphurets of iron, which are found in these stones, are of an injurious character to them, the iron becoming oxidized on exposure; the sulphuric acid acts on the mica and felspar.

Sienite is chiefly composed of hornblende and felspar.

Guernsey and Jersey granites are principally used for paving.

Argillaceous stones, such as basalt, may be ranked next; but, though very strong and hard, these stones are less durable than many varieties of the silicious stones.

Calcareous stones, such as limestone and marble, are generally considered unfit for pavement.

Of stone pavement, the best is said to be that which has been partially put in practice in some of the commercial towns of England, and the idea of which appears to have been taken from the excellent military roads of the Romans, to which I have already alluded.

In constructing this pavement, a bed is first prepared by removing the surfaces of the soil to the depth of a foot or more, to obtain a firm stratum, the surface of which receives a slight convexity of about 2 inches to 10 feet, from the centre to the sides of the roadway.

On the surface of the bed thus prepared a layer of small broken stone 4 inches thick is laid, the road is then opened to vehicles, until the first layer becomes perfectly compact.

A second layer of stone, of the same thickness as the first, is then laid on and treated in the same manner, and, finally, a third layer. When the last is perfectly compact, a coating of fine gravel is spread evenly over it, 2½ inches thick, to receive the paving blocks, which are of a square shape, but of different sizes, according to the nature of the traffic.

The largest are 12 inches long, by 9 broad and 10 deep; the smallest are 10 inches long by 5 broad and 6 deep; they are well rammed by means of a heavy beetle, and bedded with hydraulic mortar; the surface has a convexity of 6 inches to 30 feet on its cross section. With regard to the cost of stone pavement, I find it stated that some in London cost 18 shillings per yard superficial, but that some of an improved description, at Euston Square, was laid at 12 shillings the yard, in 1850. I have now concluded my observations on stone pavements, which I should have altogether omitted in this Paper, had I not considered it right to mention the characteristics of and observations made on a system of pavement, which, however inapplicable here, had been very extensively used, not only on the continent of Europe, but also in Great Britain.

For my own part, I would add, that I look on the adoption of stone pavement in Australia as most improbable, and should wood paving prove, as I suspect its trial will, superior to every other description of material for the streets of Sydney, I trust that stone may never be introduced here, for I feel sure the citizens will regret they ever saw the day of its introduction.

I shall next make a few observations on macadamizing, and then proceed to the consideration of wood pavement.

In selecting stone for macadamizing roads or streets, toughness is the most essential quality, and the stones which contain this requisite in the greatest degree, are whinstones, basalts, granites, and beach pebbles.

The advantages of pavement over macadamizing streets are considerable, when the traffic is great. The latter system has few, if any advantages for public thoroughfares, in or near large towns, where there is heavy traffic, in consequence of its rapid cohesion, requiring the frequent application of new metal, the uncertainty of its condition, the abundance of mud and dust it produces, and the great expense of maintenance; it also requires much more attention in sweeping and scraping.

Another circumstance which should be taken into consideration, although at present there may be no difficulty on the subject, is the necessity of providing large and convenient depots for the broken stones, from whence they may be carted to the various parts of the city. I anticipate difficulties will be found to arise in future years on this subject, should the streets continue to be macadamized.

The great difficulty of procuring proper materials, and the distance they have to be conveyed before they arrive at their final resting place, together with the various descriptions of transport necessary for their conveyance, each of which must of necessity add to the expense, render, I think, serious obstacles to the adoption of broken stones to form the surfaces of the streets of Sydney, and urge the necessity of enquiry as to what would be the best material to use.

At the same time, I think that where the streets are not level, and where heavy traffic seldom passes, it would be an unnecessary expenditure to use pavement, and that broken stones might be advantageously applied.

One writer on this subject states that whenever the street surfaces are found to be worn down above three inches per annum, it will be more economical to use pavement, especially for

16 feet of the centre of the street, even if the sides are made in the ordinary manner.

The following particulars respecting the cost, &c., of the metal, used in forming the streets of Sydney, will explain some parts of what I have already stated.

The blue metal is procured principally from the Pennant Hills, about 2 miles from the Parramatta River, and about 12 miles I believe from Sydney. It is found there in abundance in a conical hill, but a better description has lately been procured from Melbourne, whence it is brought as ballast in ships. The quarrying costs about 3s. per ton; the breaking, 5s. per ton, the carting, 5s.; the transport in boats to delivery in Sydney, 6s. There are also some other expenses, which makes the cost per ton (delivered on the streets) about 21 shillings.

A ton will cover about 4 yards superficial, laid on 6 inches thick, but 10 inches in two coats is the proper thickness for constant traffic.

The formation and metalling of Parramatta-street, I believe, cost upwards of 18s. per yard superficial (being nearly half more than stone pavement in London!)

There is a peculiarity about the metal here, which is very objectionable, but I fear unavoidable, whilst it continues to be used. I mean, its slipperiness in wet weather. No one can have ridden or driven fast in the streets, especially those whose cross section is very round, without experiencing this defect.

I find it stated, that macadamized streets in Birmingham wore down as much as four inches per annum. The cost of maintenance was 4d. per superficial yard; watering and cleansing cost 2d. per yard; whilst the cost of cleansing pavement was stated to be only one halfpenny per yard.

(To be continued.)

REVIEWS AND MEMORANDA.

Letter No. 2.

Of the many who have read Sir W. Denison's Paper on the Moon's Rotation, in *The Magazine of Science and Art*, of last July, few, perhaps, are aware how fiercely the question was contested in England some few years since.

One of the Inspectors of Schools, not—it may be remarked—a man of any great pretensions to scientific knowledge, finding the usually received description of the moon's motion in some elementary treatise, wrote a letter to *The Times*, pointing out what appeared to him to be its absurdity, and expressing wonder that it should so long have remained uncorrected; thereupon followed a host of letters from mathematicians of all sorts—amateurs, professors, and astronomers; the matter was discussed by Philosophical Societies and Mechanic's Institutes, and even occupied the attention of the British Association, at one of its meetings. Every astronomer was expected to illustrate his views in every way that could be devised for the benefit of his friends, and usually had the satisfaction of finding, after all, that what all the mathematicians in the world knew to be right, all the unlearned still maintained to be wrong. As usual in such controversies, the whole question hinged on the meaning of one word—namely, "Revolution."

A's idea of Revolution was this:—Suppose a rod placed on the table, turning freely round a pin driven through one end, to the other end attach any body, and turn the rod round the fixed point; then the body describes a circle round that point, and always turns the same face towards it. Such is revolution, and such is the motion of the Moon round the Earth; therefore, the moon revolves round the earth and does not rotate round its own axis.

B's idea of revolution is this:—Let a body be carried round a fixed point in any kind of curve, not being rigidly connected with that point, and always facing the same direction in space; then will it be turning from time to time a different face to the fixed point. This is a case of simple revolution, and in order that such body may always turn the same face to the fixed point, it is necessary to superadd a motion of rotation, whereby it is carried once round its own axis during the period of a complete revolution.

Thus B combines two kinds of motion and uses two words to effect what A fancies he can do with one kind of motion and one word.

Then why not adopt A's idea, which is simpler and more comprehensive than B's? Because it is impossible to do so. The moon does not describe a circle round the earth, but an ellipse, neither does it always turn exactly the same face towards it; so that something has to be added to A's idea after all; in addition to his motion of revolution he must suppose a motion of translation, whereby the moon's distance is increased or diminished, and a small motion of rotation, which must be of an alternate oscillating character, instead of continuous, in the same direction. Since, then, nothing can be gained by A's definition, except a considerable amount of confusion, where none existed before, we shall do well in this new land to retain the old definitions, and to allow that whilst the moon describes

an elliptic orbit round the earth, it does at the same time rotate round its own axis in such a manner as always to turn very nearly the same face towards us.

As the Chinese are a common subject of discussion, the following peculiarity in their astronomical calculations may possess some interest, as an additional instance of the singular manner in which they are distinguished from other nations. In the old astronomical systems, Hindoo, Arabian, and Grecian, the circle is divided into 360 equal parts, probably because the arc described by the earth in one day in the Ecliptic is nearly $\frac{1}{360}$ part of the circle; and there is no number near to 360 which possesses the convenience of having so many divisors. But the Chinese astronomers, having discovered that the earth described its orbit in 365¼ days, have divided the circle into 365¼ equal parts, and still continue to do so, regardless of the inconvenience which such a division occasions.

The following extract from a newspaper points out an ingenious and valuable use of extensive lines of electric telegraph:—

The Canadian Institute are trying to organise a plan proposed by Professor Kingston, of Toronto, for telegraphing the approach of storms. Twenty stations are fixed on, ranging from Halifax to Goderich, in Upper Canada; and it is thought the plan may be worked at a cost of 200 dollars a year. One of the data on which it is based is, "that gales prevail in some localities many hours, sometimes two or three days before they reach other places only a few hundred miles distant." Hence, half-hourly signals may be flashed along the coast of the sea and of the great lakes, and mariners may prepare for the blast, or get out of the way; and landsmen may be warned of the hurricanes that rush at times with fearful destruction across the fields and forests. Toronto is to be the central station; and there tabulated records will be kept of all the phenomena.

It is scarcely necessary to point out that when the line connecting Sydney with Melbourne, Adelaide, and Hobart Town, is completed, the same principle—supposing that we possess a sufficient knowledge of the course of storms on our coasts, may be applied on an extensive scale to the great benefit of our shipping interests.

Another more obvious and less important use of the telegraphic wire is that it will enable all the towns through which it passes, that have a telegraphic Station, to have their clocks set either by Sydney time, or their own, allowance being made for the assumed known longitude of each place.

The following simple method of firing a gun as a time signal has been suggested and probably adopted elsewhere. At whatever time it may be required to fire the gun, let a signal be given from Sydney a minute before; the person in charge at the other station (as Goulburn for instance) could immediately connect the telegraph wire with a special wire, one end of which was immersed in the priming of the gun within spark distance of the end of another wire connected with the earth. By completing the galvanic circuit at Sydney at the instant of dropping the time ball, a spark would be made to pass from one wire to the other, and thus the gun would be fired instantaneously. This suggestion might be worth the notice of the inhabitants of such places as Parramatta and Goulburn, who might think the advantages derived from such an arrangement equivalent to the cost with which it wonld be attended.

By a trifling addition to the Observatory arrangements it might be so contrived that the same impulse of the clock which dropped the ball at Sydney, might fire the gun at Goulburn or any other station.

Mr. MARKHAM ON THE ORIGIN OF VEGETATION.

The Australian colonist who happens to possess a spirit of investigation, or a taste for scientific pursuits, labours under great disadvantages, especially if he chances to live in the remote country districts.

Shut out from all intercourse with men of science with whom he might discuss his views, and having access to a very limited supply of scientific works, he has not a fair chance of correcting his errors, or of discovering when he is pursuing a theory that has been already tested and condemned.

Popular scientific works, the scum of science, which by their specious pretences and plausible perversions of facts have obtained a certain amount of favor with the unlearned, are much more likely to find

their way here, after their popularity has been exploded, than those more solid, but perhaps less attractive productions in which their fallacies have been exposed.

Of this class is the well-known *Vestiges of Creation*, which may possibly be answerable for some of the ideas propounded by Mr. Markham in his paper on the "Origin of Vegetation."

Ignoring the existence of any external creative power, Mr. Markham deduced the whole natural creation, as it now exists, by a series of connected links from two first elements—air and water.

In thus starting a novel cosmogony, it is enough for the writer to say that he feels perfectly justified in stating his leading principles, without shewing from whence they are derived, or what are the arguments in their favour? Yet this is the course pursued in this very startling paper. But if those two elements alone existed, compound elements as they are, how came the dry land to appear by the mere division of the waters?

The numerous components of what is included in the term "dry land" must all have existed independently of air and water, which contain but a small number of them. But let it be granted, as perhaps was intended, that the so called air and water held in solution all the elements of the present forms of solid matter; that those elements settled into rocky masses, which the divided waters laid bare to the action of wind and tide; that the hard rock crumbled into earthy soil, and so became fitted for the reception of the vegetable tribes; where, after all, is the vital energy that can give birth to vegetable life, and how could vegetable substance be the source of animal life? To these questions, science has given no answer; "science falsely so called" has indeed endeavoured to do so, but has been abundantly refuted, and all the deep investigations of philosophers of all ages have failed to supply any substitute for the series of creative acts which all religious systems agree in assigning to a creative God.

Omissions.—Page 255, line 3, in the May number, insert after "discovered" "is there not abundant evidence."

W. S.

Note.—We regret that a press of matter prevents our reprinting the letter signed "New South Wales," upon which our remarks on the Experimental Farm were founded. It will, however, be found in the columns of the *Sydney Morning Herald*, with a reply by Mr. T. W. Shepherd, and a rejoinder.

CORRESPONDENCE.

REV. MR. SCOTT'S CRITICISMS.

To the Editor of the Sydney Magazine of Science and Art.

Sir—Any one may see how Mr. Scott (in page 264 of your last *Magazine*) misrepresents the contents of my Paper "On Clouds," by looking over that rather lengthy paper (pages 163 to 176), or merely reading the brief conclusions (page 176).

I never enunciated, as a *new theory*, the non-agency of electricity. What I did was, to propose theories concerning the forms and causes of clouds, and to attempt to shew that they are the simple effects of heat and motion upon bodies of air containing moisture. Then, I finally argue, "that is unnecessary to suppose that electricity possesses any active agency in the production or modification of clouds." This may certainly be termed a theory—but it is a *negative theory*, which fifty persons might prove upon fifty different grounds. An electrician might assert, for instance, that electricity is incapable of the effects observed; another person, that the mechanical power of lightning is inconsiderable, and so on. To prove the negative proposition, "A is not B," it is sufficient to prove that "A is C, D, E, &c., of which one or more is not B. Kamtz may use the argument C, Schubler the argument D, Sir John Herschel the argument E, and I may still attempt to use the argument F, without being liable to the charge of plagiarism which Mr. Scott would fix upon me. This simple point of logic could not have escaped that gentleman.

But if Mr. Scott acknowledges to a misapprehension of this point, I have yet to ask him, why he omits the very last nine words of my paper ("a conclusion which is, on general grounds, highly probable"), while quoting the eighteen words immediately preceding? or, why he has entirely overlooked my quotation from Sir John Herschel's Essays (paragraph 81 of my paper), while searching out, himself, no less than three sentences from German and other authorities, with the purpose of proving that "Mr. Jevon's is no new theory." If Mr. Scott had not omitted my last nine words, and the sentence of Sir J. Herschel, it would have instantly shown that I had carefully guarded myself against any charge of plagiarism arising from a misapprehension of the point above explained. As it is, the more authorities Mr. Scott can produce as to the non-agency of electricity, the more he confirms my theories as to the formation of clouds, which form one ground for asserting that negative theory.

Hoping that Mr. Scott may, in future, better succeed in "provoking" profitable and friendly discussion.

I am, Sir, your obedient Servant,
W. S. JEVONS.

Double Bay, June 23rd, 1858.

With regard to Mr. Scott's remarks on "Geology and Genesis," I may draw his attention to a paper lately read before the Royal Society upon the "Geological History of the Alluvial Land of Egypt," by L. Horner, Esq., V.P.R.S

(Also, see *Saturday Review*, February 20th, 1858.) It appears that, in boring into the alluvial flood deposits, a small piece of pottery was brought up from the depth of 39 feet, which Mr. Horner shows to be a record of the existence of man 13,375 years before A.D. 1858, and that man must, even then, have been in a state of partial civilisation. The "abundant negative evidence" of man's existence in earlier periods than that assigned in the Biblical account, is quite unavailing against this fragment of positive evidence, confirmed as it is by Chevalier Bunsen's opinion previously expressed, "that the first epoch of the history of the human race demand at least a period of 20,000 years before our era, as a fair starting point in the earth's history."

If Mr. Scott asks whether "a difference of opinion really exists among geologists of any note in the present age," with regard to fossil human bones proving him to have been contemporaneous with icthyosauric and other primæval monsters, I think I may answer him in the negative. There is internal evidence in man's perfect structure that he is the latest and highest object of Creation. But when a fragment of evidence turns up in a deposit, scarcely to be termed geological, yet proving that his history already extends over a period that the mind can scarcely grasp, what a grand idea does it communicate of the previous geological ages, or still more of the periods elapsing between the several creative acts as mentioned in Genesis. If a soil deposit, 39 feet deep, in a narrow valley indicate 13,000 years, what shall we say of the sandstone formation, of which this Australian continent is chiefly composed, to be measured as it is only by thousands of miles in length and thousands of feet in thickness. There is but one analogy I know of to impress such immensities of time —the periods of man's history, long as they are now known to be, bear no more proportion to the periods of geological or cosmical history than distances upon the earth, or within the earth's orbit, bear to the distances of the remotest stars and nebulæ. In short, they are inappreciable.

W. S. J.

To the Editor of the Sydney Magazine of Science and Art.

London, April 10.

SIR—The great eclipse of the sun has taken place, and though much disappointment has been generally felt at the unfavourable state of the atmosphere, many interesting appearances have been observed, and many meteorogical facts recorded.

It must be confessed, however, that of the appalling phenomena said to accompany such events, and predicted by astronomers, few were even indicated; in fact, owing to the cloudy state of the weather, the eclipse might have passed over, in most parts, without even being noticed by those who did not expect it.

Of those observations which have been made, the most exact are,—the numerical observations on temperature, amount of light, &c., made by members of the Metereological Society and others; and the most generally interesting descriptions of the remarkable atmospheric and other appearances seen in some parts. To begin with the more popular.

In and near London, very little was seen; the eclipse commenced about twenty minutes to 12; and, long before that time, housetops, towers, and other points of observation, were crowded with spectators; the grand new Victorian Tower of the Westminster Palace was honoured by a large party of ladies and gentlemen, including that important individual—the *Times'* reporter. The weather, in the early part of the morning, had been glorious; but, by the time anything was to be seen, the sky was covered by heavy grey clouds. From about half-past twelve o'clock, a gloom seemed to be settling down over everything; and about one o'clock the darkness was quite noticeable, though never great enough to prevent ordinary print being read—at least, out of doors. Shortly before this time, a change of wind allowed glimpses to be caught in some parts, of a slender white crescent faintly struggling through drifting clouds; and from that time to the end of the eclipse, occasional breaks permitted the gradual victory of the sun to be viewed by many anxious Londoners. The return of light, after the time of greatest darkness, was universally remarked to be much more sudden than its decrease; so sudden, in fact, that many persons exclaimed that daylight had come back again.

In many parts of the provinces, better views were obtained. The Great Northern and Great Western Railway Companies had organized special trains to Peterborough and Swindon, in both of which places, being situated on the *central line*, or line upon which the centre of the moon's shadow passed, the eclipse was annular or ring-like. To the former of these places, a large number of spectators thronged both from London and the North; only occasional glimpses were obtained; but one happened, fortunately enough, just at the time when the ring was complete. At Swindon, nothing whatever appears to have been seen. Near Lyme Regis and Dartmouth, in Dorsetshire, where the eclipse was annular, or nearly so, very good views seem to have been obtained. A correspondent from the latter place has given the best description we have seen of the general appearance of the earth and sky.

There appears to have been no perceptible diminution of light till the sun was ⅔ covered; and from that time till ⅞ was obscured, the diminution was still gradual; it then became more rapid; and suddenly, "a dusky shadow began to sweep by from the south-west, evidently darkening the headlands three or four miles away before reaching the spot where I stood; distant cliffs became a deep purple, though their forms were as distinct as ever; little islets half a mile off became black as ink; the sea itself presented a singular olive-streaked appearance, and nearer scenery assumed a strange unnatural hue, not unlike a transparent photograph seen against imperfect light. The clear sky was an intense indigo colour, but there was no great increase of shade in the clouds. This deep shadow did not last more than a minute, when the bright edge of the sun was seen; and in ten minutes, the landscape was as bright as ever.

(*To be continued.*)

METEOROLOGICAL REPORT.

SYDNEY, MONTH OF MAY, 1858.

FROM OBSERVATIONS TAKEN AT 9 A.M. AND 9 P.M. EACH DAY.

May, 1858.	Barometer Reduced, &c.	TEMPERATURE OF AIR. Mean of 9 a.m. and 9 p.m.	Maximum.	Minimum.	Range.	MOISTURE. Dew point.	Rain. Inches.	Sun's Heat. Degrees.	CLOUD. Extent.	Form.	WIND. General Directions.	REMARKS ON WEATHER, ETC.
1	30·399	59·1	67·8	53·3	14·5	55·3	·08	87	3	Cu.	Variable.	Fine, calm, or light breeze.
2S	·404	60·6	69·0	48·4	20·6	52·8	·0	95	3	Cu.	ESE.	
3	·420	60·5	71·0	46·4	24·6	53·0	·0	92	7	Ci.-St.	East.	Mist. Haze from W.
4	·411	59·5	68·8	56·3	12 5	58·2	1·14	79	5	Ni.	NNE.	Heavy rain in morning.
5	·369	60·1	71·9	53·0	18·9	58·2	·06	108	2	Cu.-Ci.	NNE.	Misty mornings, moist thick air.
6	·174	65·1	70·3	53·5	16·8	60·6	·0	100	4	Cu.	North.	
7	·060	63·3	78·3	55 6	22·7	57·4	·01	102	2	Cu. St.-Ci.	WNW.	Warm dry wind.
8	·115	60·2	64·6	52 3	12·3	57·9	·87	78	10	Ni.-St.	Calm.	Rainy day.
9S	·100	59·8	67·9	51·9	16·0	55·0	·0	81	5	Ci.-St.	SSE.	Haze. Red sunset.
10	30·010	58·1	62·0	56 0	6·0	55·0	2·98	61	10	Ni.	South.	Heavy rains.
11	29·982	55·6	67·6	51·7	15·9	53·1	·63	80	1	Cu.-Ci.-St.	SSE.	Fine. High sea.
12	·896	62·0	..	49·3	..	57·1	·0	82	4	Ci.-St.	North.	Strong wind.
13	·848	56·9	69.8	54·6	15·2	46·4	·0	90	4	Ci.-St.	WNW.	Warm dry wind.
14	·788	51·4	67·8	41·6	26·2	43 8	·0	95	0	..	WSW.	Air very transparent, and cloudless.
15	·838	54·8	68·4	41·6	26·8	47·8	·0	84	0	..	WSW South	
16S	30·030	53·7	70·0	46 3	23·7	48·8	·0	97	0	..	SW. NE.	Cool and fine weather.
17	29·938	55·7	71·6	43 8	27·8	52·0	·0	97	1	..	NE.	
18	·815	54·0	70·6	50·7	19·9	52·2	·06	97	5	Ci.-St.	Variable.	Confused clouds.
19	·836	52·0	65·8	40 6	25.2	45·2	·0	87	0	Cu.	South.	Extremely fine, cool, dry air.
20	30·136	52 6	60·0	42·6	17·4	37·8	·0	75	5	Cu.	SSE.	
21	·385	53·3	62·6	46·3	16·3	44·5	·16	71	8	Cu.	SSE.	High sea.
22	·338	48·4	66·3	41·6	24·7	45·5	·0	91	0	..	SW.	Cloudless and calm.
23S	·308	48·2	64·5	37 0	27·5	44·0	·0	87	0	..	South.	Extremely fine.
24	·302	53·8	63·3	42·3	21·6	52·3	·12	77	10	Ni.	SSE.	Small rain.
25	·189	56·1	63·8	51·3	12·5	54·4	·24	66	10	Ni.-Cu.	East.	Threatening clouds.
26	29·949	56·6	59·1	54·8	4·3	53·8	6·10	59	10	Ni.-Ci.-St.	SE. South.	Torrents of rain.
27	·905	50·0	63·5	41·0	22·5	47·1	·0	91	0	..	NNW.	Clear cool days. Light breezes.
28	·944	53·8	63·8	38·5	25·3	46·8	·0	82	1	Ci.-St.	Variable.	
29	·859	49·5	65·8	40·3	25·5	45·4	·0	89	1	..	West.	
30S	·887	53·4	68·6	40·8	27·8	46·5	·0	89	4	Ci.-St.-Cu.	WNW. West	Strong westerly winds.
31	·972	50·4	65·1	39·8	25·3	43·3	·0	89	0	..	West.	
..	30·430	67·1	78·3	..	41·3	60·9	6·10	108	10	Highest of single readings		
..	29·775	44·8	..	37·0	..	36·8	..	..	0	Lowest at 9 a.m. or 9 p.m.		
..	30·084	55·8	67·0	47·2	19·8	50·8	11·85	85.7	·37	Means and Sums, May, 1858.		
..	30·174	53·8	65·0	45·5	19·5	48·7	4·74	..	·43	Means and Sums, May, 1856-1857.		

N.B.—The observations are *not* corrected for diurnal range. The principal instruments have been compared at Greenwich, and the readings are all reduced accordingly.

Pressure.—The barometer is 11 feet above the sea-level. The greatest range of pressure is ·655 inches.

The mean gaseous pressure of dry air is 29·713 inches. The average weight of a cubic foot of atmospheric air is 540 grs.

Temperature of Air.—The mean of all self-registered maxima and minima is 57·1 degrees. The *adopted mean temperature* of the month is, therefore, 56·4 degrees Fahrenheit. The corresponding mean result for the two previous years (May) is 54.6 degrees.

Moisture.—The dew-point is calculated from readings of Negretti's and Zambra's dry and wet bulb thermometers, by the use of Glaisher's tables. 2nd Edn.

The mean temperature of evaporation at 9 a.m. and 9 p.m. is 53·2 degrees. The mean elastic force of aqueous vapour is ·371 inches. The average proportional humidity of the air is denoted by 84, perfectly dry air being taken as 0, and saturated damp air at 100.

Rain.—More or less rain fell on 12 days during the month, and on 3 of these days the depth was more than one inch. The rain is collected at one foot above the ground, and measured at 9 p.m.

The total depth of rain is 11·85 inches, which is greater than the quantity fallen in any one month since April, 1855.

Sun's Heat is indicated for each day by the highest reading (self-registered) of a thermometer with a blackened bulb, placed one inch above the ground.

Cloud.—The extent of cloud is expressed by the tenths of the whole sky covered by it.

The forms of clouds are denoted as follows, the number of days of which each kind occurred being added in figures.

Cu.	Cumulus 11	Ci.-Cu.	Cirro-Cumulus 0
Ci.	Cirrus... 2	Ci.-St.	Cirro-stratus 9
St.	Stratus.. 2	Cu.-St.	Cumulo-stratus 0
		Ni.	Nibus..6.

Winds.—The winds may be thus summed up.

NNW	1 days.	SE.....	½ days.
WNW	2½ „	SSE	1 „
West	2½ „	East	2 „
WSW	1½ „	NE	1½ „
SW	1½ „	NNE.....	2 „
South	4 „	North	2 „
SSE	5 „	Variable ..	3 „

Calm..... 1 day.

The winds blew pretty equally from all points of the compass this month.

W. S. JEVONS.

Double Bay, near Sydney, N.S.W.

Registrar General's Office,

Sydney, 7th June, 1858.

HEALTH OF SYDNEY.

The number of deaths registered at the Central Office during the month of May is 126, viz.:—58 males and 68 females; diseases of the "Respiratory System" having been the most fatal.

The infantine mortality is exactly one half of the total deaths of the month.

The number of Deaths registered during the corresponding month of last year was 90, and in 1856, 131.

The number of Births registered during May is 200, viz.:—102 males and 98 females being 74 in excess of the Deaths.

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1ST TO 31ST MAY, 1858.

CAUSES OF DEATH.	Under 1 Year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages.
ZYMOTIC DISEASES.																											
Endemic, Epidemic, and Contagious	4	3	2	3	1	13	..	..	1	2	..	..	..	1	..	..	1	1	..	..	..	..	..	..	..	..	19
SPORADIC DISEASES.																											
Of Uncertain Seat. — Dropsy and other Diseases of Variable Seat ..	9	2	..	1	..	12	..	..	..	..	..	..	1	1	..	1	1	..	..	..	..	..	..	..	..	..	16
Of Nervous System.—Diseases of the Brain, &c.	9	2	..	2	..	13	..	1	..	..	..	..	1	..	1	..	..	..	1	..	..	..	..	..	..	..	17
Of Respiratory System.—Diseases of the Lungs, &c.	2	1	1	1	..	5	1	..	1	2	5	2	3	2	3	2	1	..	..	..	1	..	..	..	..	..	28
Of Circulatory System.—Diseases of the Heart and Blood Vessels	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	1	..	..	1	..	..	..	..	..	..	..	4
Of Digestive Organs. — Diseases of the Stomach, Liver, &c.	4	9	4	..	..	17	..	..	..	..	..	1	2	1	..	1	..	..	..	..	..	..	..	..	..	..	22
Of Urinary Organs.—Diseases of the Kidneys, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Of Generative Organs	..	..	..	..	..	..	..	..	..	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
Of Locomotive Organs. — Rheumatism, Diseases of the Bones, Joints, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Of Integumentary System.—Diseases of the Skin	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Old Age	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	1	..	..	..	..	4
External Causes. — Violence, Privation, and Intemperance	2	..	..	..	..	2	..	..	..	..	1	..	1	..	1	..	2	..	..	..	..	..	..	..	..	..	7
Unspecified	..	1	..	..	..	1	..	..	..	1	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	6
DECEASE, Total, from all Causes	30	18	7	7	1	63	1	1	2	6	7	4	12	7	5	5	5	1	2	..	2	2	1	..	..	..	126

CHRIS. ROLLESTON, Registrar General.

THE SCHOOL OF ARTS AND PUBLIC EXAMINATIONS.

We perceive, by an announcement in the public journals, that it is intended to hold an examination in the month of January next, of the pupils who have attended the various classes at the School of Arts during the present year. We highly approve of the determination, although we are afraid that, from the small number of students that now attend those classes, and the confessed irregularity of their attendance, no very remarkable results will be exhibited. It is, however, a good commencement, and should the prizemen be caught up, as those of the Mechanics' Institutions in England are, to fill public situations, these examinations cannot fail to excite great interest among the rising young men in the colony, and to stimulate future competition.

Our attention has been drawn lately to the examinations set on foot by the Society of Arts in London, and we are very much disposed to think that something of the same kind would be very successful in this city.

When we consider the great number of young men in Sydney, engaged in what may be called official life, and the severe competition that exists among them, it is not to be wondered at that heartburnings and jealousies should exist. We hear on every hand complaints, that patronage both in the public service and in private corporations is often badly bestowed.

Aspirants to vacant offices are loud in their depreciation of successful candidates, and are too ready to ascribe their good fortune to interest rather than to worth.

This imputation is generally admitted to have been well-founded in public employment in England, and so loud have been the complaints, that the English Government and the India Board have recently been compelled to establish a system of examination, which it is necessary for all candidates for employment to pass before they can obtain any footing at all.

Such has not hitherto been the case in this colony, although the Governor-General has hinted in one or two of his addresses at the School of Arts, that he should be glad to promote industrious and successful students from the members of that institution.

With a sincere desire to contribute to its usefulness, we beg to offer the following suggestions, as an addition to the proposed class examinations.

We shall preface our suggestions with a few remarks as to the probability of the acceptance of our scheme; for, from long experience, we are quite aware that the best intentioned plans often fail from some defect in their presentation to the public.

There is at the present time a keen competition for employment in Government offices, in the Banks, in mercantile establishments, and in fact in every department of industry where a certain amount of education is requisite. Hundreds of well educated young men have arrived here from England, and many possessing perhaps greater claims on the colony, from being natives of the soil, are anxiously looking out for openings in the paths we have indicated.

"Hope deferred that maketh the heart sick" doubtless induces them to believe that want of interest is the only obstacle to their success. This may be true in some few cases, but we are convinced that the greatest obstacle is the want of some satisfactory certificate of competence and ability to fulfil the duties required. In proof of this we may only point to the instances which every day occur of young men who have done something worthy of remembrance being taken from comparatively humble situations and put into places of trust. How many a young man in Sydney is yearning for some opportunity to distinguish himself?

The chances for display, unfortunately, are few. To meet this want, and to give those who have the disposal of patronage some assistance in their choice, we would propose the following plan.

We suggest, then, that in January next a series of examinations should be held at the School of Arts, or some other convenient public place in Sydney, and that prizes should be awarded to the successful competitors, accompanied with a written certificate from the examiners.

First, let us suppose an examination for the public service. A Board should be appointed, consisting of four or five heads of departments, who should agree among themselves on a series of questions which would elicit the qualifications necessary to ensure employment in those offices. They might give public notice three months before hand, specifying the character of the knowledge requisite, that on a certain day in January they would meet in the Hall of the School of Arts, and be ready to receive candidates for public employment, who would

be required then and there to perform some tasks as evidence of their fitness for office.

A separate desk, and pen and ink being provided for each competitor, the Board should meet—say at one o'clock in the day, and the candidates whose names are on the lists as applicants for situations being assembled, the Chairman should propose to them the questions which had been privately agreed upon. The doors of the Hall being locked and precautions taken to avoid unfairness, each person should be allowed a certain time—say till eight o'clock p.m.—to prepare his replies, which would then be carefully sealed up, signed, and forwarded to the examiners. The names of the successful competitors should be advertised, and at a public meeting convened for the purpose, they should be presented with the prizes they had earned. We cannot doubt but these prizes would be highly valued, but far more importance would attach to the certificate each prizeman would possess as to his competence, especially if this certificate were supplemented by testimonials from persons of credit as to his moral character and habits of industry. The combination would ensure favourable consideration in any Government appointment.

In the case of candidates for employment in public Institutions, such as Banks, a board might be composed of the managers of the various banking establishments in the city, and a double competition might be announced; first, for those young men applying for situations who have had no experience of banking routine; and, secondly, for the numerous employèes in the Sydney Banks who are aspirants for promotion. We believe the latter competition would excite a keen contest. In these establishments exception is often taken by the clerks to the promotions that are made, but should the favoured clerk prove to be a prizeman, in future detraction would be dumb. Of course we can hardly expect that the Directors of such institutions should relinquish entirely the gratification to be derived from the exercise of their patronage, but we feel assured from the high character these gentlemen enjoy, that they would allow a certificate of proficiency granted by such a Board to outweigh any recommendation derived from private friendship.

We throw out these suggestions for the consideration of the committee of the School of Arts, believing that these examinations would attract numbers of young men to become members of that Institution, in order that they might prepare themselves for such an intellectual tournament.

SUGAR PRODUCING PLANTS.

As great interest is felt respecting the growth and the amount of profit that may be calculated on from the cultivation of the Sorghum Saccharatum, we extract the following from the *Bathurst Times* of a recent date. It contains the result of an experiment made by Mr. Croaker of that town.

Knowing that many of our readers feel much interested in the result of Mr. Croaker's experiments with the different varieties of sugar plant which that gentleman so carefully cultivated during the last summer, we solicited from him some of the particulars respecting their growth, and the yield of juice from the various sorts, and by him we were kindly furnished with the following facts. The sorts planted by him were the Imphee or Zulee Caffir sugar cane, the Sorghum Saccharatum, and what he terms the Concord Millet. Of the Sorghum he planted two acres. The seeds were sown in holes (three in each), in rows three feet apart. There were 4840 holes, averaging eight stems to each hole, or 38,720 stems, weighing 23,230 lbs., and yielding 13,940 lbs. of juice. This season, doubtless owing to the drought, the stalks only averaged 7 feet in height, whereas, in a good season, the average is from 14 to 15 feet. Hence Mr. Croaker believes that two tons per acre is rather below than above the amount it will realise. This juice would produce 3485 lbs. of molasses, of which nine-tenths is sugar. Mr. Croaker himself boiled 58 lbs. of juice, which yielded 16 lbs. of thick molasses. One peculiarity of this plant is, that upon the stocks which had arrived at maturity the frost had no effect whatever; whilst those which had not, were nipped as though pinched tightly with a cord.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

EIGHTEENTH MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange, Tuesday, July 6th, 1858.

Members of Council present:—Messrs. P. L. C. Shepherd, J. Graham, and W. Deane, Honorary Secretary.

Mr. J. Graham in the Chair.

MINUTES.

Minutes of last meeting read and confirmed.

POSTPONEMENT OF THE READING OF PAPERS.

It was resolved on the motion of Mr. P. L. C. Shepherd, seconded by Mr. J. Dyer,

That on account of the severe inclemency of the weather, and consequent small atten-

dance of members, the reading of the several papers be postponed to the next monthly meeting, but that the other business be proceeded with.

LETTERS READ.

Letters read from Mr. T. W. Shepherd and Mr. W. M'Donell, excusing attendance.

Mr. F. Creswick excused attendance.

DONATION.

The following American publications were laid on the table, which the Secretary stated had been presented to the Society, by Mr. Thomas R. Leavitt, viz:—Four numbers of the *Horticulturist*, and one of the *American Farmer's Magazine*.

Proposed by Mr. P. L. C. Shepherd, seconded by Mr. W. L. Bugle,

That a vote of thanks be presented to Mr. Leavitt for his donation of periodicals, whereupon the following amendment was proposed by Mr. E. K. Silvester, and seconded by Mr. Joseph Dyer—

That the Secretary be directed to acknowledge the receipt of all books and pamphlets forwarded to him, and to express the thanks of the Society for the same, which, on being put to the meeting, was negatived and the original motion carried.

Mr. E. K. Silvester requested that the Secretary would have prepared by the next meeting a return of all books presented to the Society, for which a vote of thanks had been given to the donors.

MEMBER CONFIRMED.

Mr. Thomas Clark.

NOTICES OF PAPERS FOR NEXT MONTH.

Mr. T. W. Shepherd, on Native Plants, and the Horticultural, Agricultural, and Pastoral Resources of Australia.

Mr. Henry Badgery, on the Cultivation of the potatoe.

Mr. Edwin Hickey, F.R.G.S., &c., &c., on a Stumping Machine.

Mr. F. Creswick, on the Aphis affecting the Brassica Tribe.

Mr. Lewis Markham, on Meteorology.

The next monthly meeting will be held on Tuesday, August 3.

COUNCIL MEETING.

PURSUANT TO CIRCULAR.

Held in the Society's Rooms, June 29, 1858.

Present:—Messrs. T. W. Shepherd, P. L. C. Shepherd,—F. Creswick, J. Graham, and W. Deane, Honorary Secretary.

Mr. T. W. Shepherd in the chair.

Minutes of last meeting read and confirmed.

The further consideration of the amalgamation of this Society, with the Cumberland Agricultural Society, lapsed on account of the absence of the mover.

It was resolved, on the motion of Mr. W. Deane, seconded by Mr. P. L. C. Shepherd,

That the Annual General Meeting shall be held on Tuesday, 20th July, subject to the convenience of his Excellency the Governor-General (president).

Proposed by Mr. Creswick, seconded by Mr. Graham,

That the following gentlemen be appointed a committee, to draw the annual report, viz.:—Messrs. T. W. Shepherd, W. M'Donell, G. A. Bell, Dr. Houston, and Captain Ward. Carried unanimously.

Resolved, on the motion of Mr. W. Deane, seconded by Mr. P. L. C. Shepherd,

That the following gentlemen be appointed a Committee, to which the matter respecting the erection and custody of the tents, and disposal of the second sized tent, be referred, viz:—Messrs. J. Baptist, F. Creswick, J. Graham, G. A. Bell, and D. McInnes.

Letter read from Mr. Ottley, resigning his seat on the Council.

Accounts passed.

INJURIOUS PLANTS.

By F. CRESWICK.

At the last monthly meeting I proposed for discussion the best means for the eradication or limitation of plants injurious to the pastoral, agricultural, and horticultural interests of New South Wales; but, on further consideration, I am afraid it will not be sufficiently interesting, and am almost sorry it was proposed, as I fear it will be taking up valuable time that would have brought forward something more interesting and amusing.

It is not my intention to enumerate all plants known as weeds in this colony, but to refer only to a few which are well known to be the greatest bane to the community, and which, in my opinion, are burrs and thistles. I have no new theory or plan to offer, but will, with your permission, make a few remarks on their very pernicious and destructive effects, and what appears to me to be a

very simple method of destroying, or at least keeping them under in a very great measure—these are absolute weeds, and wherever they may be found must be considered as such, and are always more or less injurious. It is some years since my attention was first drawn to this subject by being often asked if I knew them, and if, in my opinion, any mode could be devised to extirpate them. It is only a few days since a gentleman asked me the same question, and he told me that a very great deal of the wool sent to Sydney was depreciated at least 25 per cent. in value from the injurious effects of these burrs. Sometime since I travelled over a very considerable portion of the Bathurst District, and had many opportunities of witnessing the alarming extent to which these weeds had arrived, which made me consider if any means could be employed to destroy them. The plant known as the Bathurst burr is the *xanthium spinosum*, of Wildernow, and is a native of the south of Europe, and from its utter uselessness must have been accidentally imported into this colony. The seed vessels or burrs are about the size of coffee berries —and are armed with numerous claws or hooks, by which it will hook itself and adhere with great tenacity to almost anything of a soft nature it may come in contact with, especially to sheep, cattle, or any part of clothing. I have seen thousands of these burrs sticking in the manes and on the tails and legs of horses while they have been grazing, so much so that it would be almost impossible to clear the animals without denuding them, in the operation, of the hair also. It is not long since I was told that many previously valuable sheep stations would have to be abandoned through the wonderfully rapid spread of this burr. It may not be generally known that this plant is an annual, and consequently one of the most easy to destroy; and there is not the slightest doubt that if proper means be taken, and persevered in for a few years, its baneful effects will be greatly modified, or curtailed, if the scourge itself be not totally exterminated. The system I would propose to adopt for the consummation of so much to be desired a result is as follows:—Whenever the plant makes its appearance let no opportunity be lost of cutting it down a little below, or even to, the surface of the ground. This must be done before the seed ripens, or the labour will be useless. It would perhaps be better, to make sure, to do this just before the burrs flower, or even in earlier growth, when also the labour would be less. For this purpose a small spade, or light hoe, would be the best instrument to use, but after the burrs have grown to the height of two or three feet, I should prefer a brush hook, though in the absence of such a tool any common reaping-hook or sickle would answer equally well; the use of these instruments requires very little instruction, and any shepherd, labourer, or indeed child, would be competent to perform such a simple operation. My reason for being particular in pointing out the time to cut down these burrs is, that whilst visiting one of the largest stations in the colony, I had some time previously recommended the superintendent to follow this plan, and he had ordered a large portion of the land to be cleared; but, unfortunately, he had commenced too late in the season, the seed being at the time mostly ripe: and at the time I arrived the bushes or plants had been cut down, and were quite dry, being driven by the wind in all directions over the plains, and of course shedding their seeds in their course. Now if there was one way better than another to assist nature in spreading and disseminating this weed, I believe this was the one.

The next plant we hear so much complaint about is the Scotch thistle of the colonists (being, as I believe, the *Silybum marianum* of Guertner, and *Carduus marianus* of Linnæus, commonly known as Virgin Mary's Thistle, and is in many respects a very different plant from what is known in England and Scotland as the Scotch thistle. It is generally found near old stations, stock-yards and watercourses, but always in the richest soil, and in these it will spread indiscriminately. I do not hear that this weed is of any direct injury to the fleece, but it covers the best of the land, and thus robs the sheep or cattle of their sweetest herbage, and in cultivated soil it destroys the whole crop—it is one of the quickest growing plants I know, having seen it grow five feet in diameter, in about four months. From the habits of this plant I think it could be destroyed as easily as the Bathurst burr. Nothing can be more simple than cutting it down to the surface of the ground while young. From its large spreading leaves it must be very detrimental to agriculture and horticulture—it is clear that broad leaved and broad spreading weeds are the most injurious, as they destroy everything they

grow over; I could never hear that any description of stock will feed on it. It has been asserted that this plant is disappearing in some districts, but this, I fear, is erroneous. The notion has probably arisen from the plant being a biennial; it is natural for it to grow, flower, dissemminate in seed, and then die off. If the parties making this assertion had have returned to the spots where they missed these weeds in the winter or spring following, they would have found that for every plant they had seen, ten, or in many instances one hundred, had sprung up in its place.

Neither of these weeds can continue but by a renewal from seed; the first, as we have seen being annual, the last biennual. From the very conspicuous nature of both, when their character and natural habits are more generally known, their extirpation will not be a matter of such great difficulty. The thistle, however, has one redeeming quality, namely, it may be used for food, by being bleached in the same manner as endive, when it will make a very paletable salad; the roots, after the tops have been cut off, may be used as skirret or salsafy, and the young stalks, by being peeled and soaked in water to extract their bitterness, when boiled, is a very good vegetable. I mention these things, as they may prove serviceable to many in the interior, where vegetables are rarely to be met with, and this plant is more than plentiful.

There is another plant known to the colonist as the Scotch burr—the name of it is *Medicago nigra*, and is one of the yellow trefoils. I do not think this plant is indigenous to this colony, but its burr is much more injurious to the fleece than the Bathurst burr; its form is that of the shell of a snail, with close folds armed with many hooks, by which it adheres to the wool. I have been told that much wool has been sold in Sydney for 7d. or 8d. per pound which would have readily brought 15d. but for being infected with this burr. In fellmongering the skins are often matted together by the vegetating or sprouting of these seeds, which must of course be very detrimental, and after the seed has vegetated, still the burr remains; and it has been found necessary to employ children to pick them out by hand, which, I am informed, costs in England from 1d. to 2d. per pound, as no machine will effectually perform that operation. The tenacity of the claws or hooks is found so great that it is impossible entirely to clear the wool from them. I have not been able to examine this plant so minutely as I could wish, and am not sure if there are not two or three plants of distinct species bearing this name, and from what I have seen of it I am afraid there will be more difficulty in extirpating it than either of the other two. I have generally seen it growing near water courses, and do not remember ever to have seen it, to any extent, except on low ground; if such is found to be the case, I should think mowing it in the spring would very much check it. It grows very luxuriantly, and in spring may be seen from nine inches to two feet long, while the grass around it probably is in a sickly and languishing state; it does not generally grow singly, but in very large patches of acres, entirely covering and taking up the land. Cattle prefer almost every kind of herbage to this, which is proved by its being found full grown and perfect, while the grasses that surround it are cropped to the roots. It is apparent that it is necessary that these plants should be exterminated not only from their injurious effects on the wool, but also, as they must, to a very great extent, exhaust the capability of the soil, and, if allowed to spread, the agriculturist will find his land useless. In conclusion, I would beg to remark that my motive for bringing forward this subject is more to induce others with greater ability and better opportunities than I can command, to turn their attention to the means of getting rid of this terrible scourge; and perhaps the Legislature may be induced to pass some law by which squatters and others, who occupy the public lands, may be prevented from spreading the burrs alluded to, and thus destroying the country for the purposes of the next generation.

PROCEEDINGS OF THE PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

The Second Monthly Meeting of the present season was held at the Australian Library, in Bent-street, on Wednesday evening, June 9. The evening was very tempestuous, and there was consequently but a small attendance. In the absence of the President, Andrew Bonar, Esq., was voted into the Chair.

The Secretary, Captain Ward, assisted by other members of the Society, proceeded

to read a paper on vaccination, compiled by Dr. Greenup, of Parramatta.

The paper contained a very able history of this great discovery, and entered at great length into a refutation of the alleged drawbacks from the advantages of vaccination, and also of the alleged dangers of the practice. The paper is far too long for publication in our columns, as it would fill the whole of the space at our command, but we should be very glad to see it published in a separate form, that the great mass of information it contains might be generally diffused through the community.

A vote of thanks was unanimously passed to Dr. Greenup at the conclusion of the paper.

We resume our publication of Lieutenant Vigors' paper, on Pavements and Street Surfaces, the importance of the subject on which it treats having been very painfully brought under the notice of our citizens during the past month. We fear it would be difficult to find in the British dominions any city with an equal number of English born residents, where the streets and thoroughfares are in such a disgraceful condition.

PAVEMENTS AND STREET SURFACES, &c.

WOOD PAVEMENT.

(Continued from page 15.)

HAVING now considered the several descriptions of stone covering for streets, I come to wood, which I hope will on examination and trial prove as advantageous as I fully believe it to be, and the only proper pavement for the streets of this city; and I trust I may be excused in noticing the origin and history of this invention—as far as I am able to do in a paper of this nature—the necessary limits of which prevent me from enlarging on any of the systems under consideration.

A Mr. Stead was said to be the original patentee of wood paving (by letters patent, taken out in 1838), and in consequence of some encroachments on his patent, he brought an action in the year 1843 against the Metropolitan Wood Pavement Company of London, and in the trial reference was made to the various descriptions of wood paving, which were said to have been previously in use. Mr. Stead specified that the wood should be cut in blocks of equal size and length, sexangular, and placed with the fibre in a perpendicular position, on a hard surface of gravel—dowels being used to connect the blocks.

Mr. Stead stated the invention was communicated to him by a merchant at St. Petersburgh.

A previous invention for wood pavement was reported to have been recommended as far back as 1825, by a Mr. Finlayson, and another process by a Mr. Iveson, who proposed to enclose 18 blocks of wood in iron boxes, which latter were to be laid alongside each other, to constitute the pavement, the bottom of the box being intended to prevent the blocks from sinking unequally.

In 1832, a Mr. James Heard wrote a letter describing a road he had seen near St. Petersburgh; the under surface was a bed of gravel well rolled, &c., about 10 inches lower than the intended level of the road surface; the blocks were hexagonal and secured to each other by pins, 6 inches long, and it was supposed that Mr. Stead borrowed his ideas of pavement from this system. It was also proved that, as early as 1823, wood pavement had been used at the Box Inn, in Surrey, and at Dorking, in 1827. Hammersmith Bridge was also floored with wood in a curious manner about this period.

Stead's patent was laid down in Oxford-street in 1838, and up to September, 1843, no less than 49 patents had been taken out! And, in writing of it, the *Polytechnic Journal* some years after, said, "That which is now hailed as one of the most valuable improvements of the day, was five years ago declared monstrous and the conception of a madman!"

Amongst those which have been most approved of, I may name Perrings', the Hemitrope, Tillie's, the Count de Lisle's, Cramer's and Kemp's, Saunders's, Larkins', and Dotesieos.

Perring's patent was dated in 1842. The blocks were cut at an angle of 45 degrees, so that, when placed upon the ground with the fibres inclining at that angle, the block should be 6 inches deep and 6 inches square.

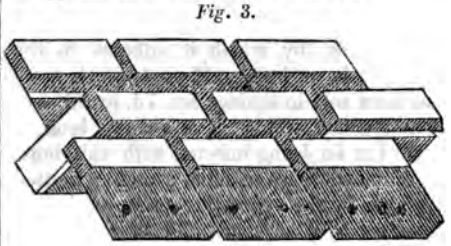
Scotch fir was the timber used, of an age of about 35 years.

Each block leaned on another block, and they were pierced on their vertical sides for the reception of oak pins; slabs, one inch thick and 4 deep were placed between each row of blocks, with holes drilled through them to allow the connecting pins to pass.

These slips formed transverse grooves sufficient to carry off the soil and water from the surface, and gave a secure foot hold for horses.

The edges of the blocks were also chamfered off ⅛ of an inch, and each row reclined alternately in opposite directions across the street.

Fig. 3.



A concrete foundation of six inches was first laid, and rounded sufficiently to carry off the water into the side channels.

One advantage of this description of pavement was, that the under side of the blocks could be used whenever the other became worn.

Samuel Dotchin's improvement on Mr. Stead's invention was, that the blocks were to have their sides inclined at alternate angles to the top and

bottom surfaces, instead of perpendicular to them as at first adopted. By this improvement each block might support and be supported by the surrounding blocks.

The Hemitrope, or interlocking double-wedge block pavement, was strongly recommended.

It was cut most economically from round timber, as shewn in the annexed sketch, *figs.* 4 and 5 : —

Fig. 4.

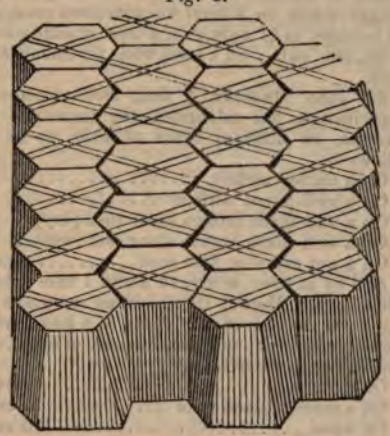
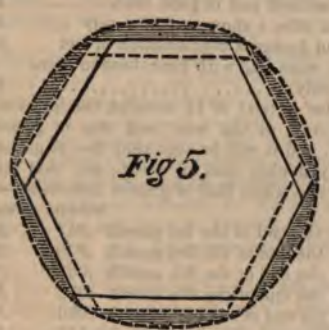


Fig. 5.



The upper surface consists of six sides, three of which are larger, and three smaller, than the sides of a hexagon inscribed on the same circle.

The underside has the same boundary lines for its sides, but these are turned round in such a position that each of the larger shall be parallel to the smaller and *vice versa*, thus forming two triple wedges, the one to resist upward and the other downward pressure; the sides are not at right angles to the surfaces, but 10 degrees more or less from it—these blocks have two diagonal grooves across them.

These blocks were produced by a machine in four operations,

Firstly. They were cut into lengths of 6 inches; they then received the first two cuts at the proper angle from parallel circular saws; they were then returned and cut for a second pair of sides, and again the same process is repeated, which finished the block for grooving.

Scotch fir was the timber used by this patentee.

From the nature of these blocks reposing on each other, it will be seen that on a weight coming on any block, it is distributed to each of its three neighbours, who again distribute it around them, hence a much less expensive foundation is considered sufficient for this pavement.

Both this system and Stead's are said to have the advantage of one shilling per yard over the Count de Lisle's system, and on the gross expense of preparation and laying, the Hemitrope has a saving of 10d. per yard over Stead's, and of 2s. 11½d. per yard over the Count de Lisle's.

The system which bears the name of "Tillie" was invented by Colonel Sir John Tillie, and introduced in Bologne in 1843, and it was thought it would have been laid down between that town and Amiens (80 miles), as a substitute for a railway—locomotive engines being enabled to travel on it.

It was afterwards introduced into England, and that tried in Piccadilly in London bore out the favourable reports of its use in France.

The advantages claimed for it above all other descriptions of paving, were economy, facility of laying down, and freedom from danger to horses.

The patentee in this case availed himself of the existing surfaces of the streets for foundation.

Spaces of about one inch wide were left between the sections of wood, which served to carry off the water and prevent slipperiness.

In February, 1845, Messrs. Cramer and Kemp took out a patent for wood paving, specifying that the substratum should be of wood, as well as the superstructure, and in describing their system, they said truly, that public roads and ways must be taken for what they are, and not as carpeted avenues to the abodes of affluence and luxury, but as thoroughfares for traffic, and beasts of all kinds, travelling at all rates of speed.

The first plan they recommended, I find, was to use blocks of two sizes in height and thickness, laid in rows (with the grain vertical), the high and low blocks alternating in each row.

Another of their plans was to alternate the rows at an angle, sloping so many degrees backward and forward in rows, parallel to the longitudinal axis of the street with diagonal grooves.

The method recommended by Mr. Saunders, was the use of blocks, forming a combination of two three-sided wedges, acting opposite ways, with a nine inch bed; wrought iron ties (¾ of an inch in diameter) to be used to brace several blocks together.

Another system, proposed in 1846, by a Mr. Larkin, was to lay wood paving in parallel lines, with a stone-paved or a macadamized roadway in the centre for the horses to travel on; three or four lines of such pavement being laid in each street. Whether this system was found successful, or even whether it was ever adopted I have not been able to discover.

Mr. S. C. Brees, writing in 1853, says, "Wood pavement has been repeatedly tried in this country (England), and with various success. The blocks should be formed polygonal, and laid upon a bed of concrete or asphaltum, and the hexagonal shape from 6½ to 9⅜ inches is the most general; it is said to have succeeded very well abroad, and has been extensively used in America, and for footways in Toronto, 1843. I

think it very probable that it might be suitably and successfully employed in this city in place of sandstone flagging, which wears down so soon under constant traffic.

The conditions which have been assigned by the best authorities on the subject, as essential to the formation and application of a good system of wood paving are—

An efficient substratum.

A cohesive superstructure of wood. A simple mode of construction, inclusive of facility of removal and replacement.

An elastic position of the fibre of the wood, and the power of using any necessary grooving.

Another writer (Mr. D. S Hope) considered the following as the requisites for a good road or pavement, and as being convenient for considering the qualities of the materials:—

1. There should be a solid and compact structure capable of resisting the effects of traffic, as far as possible.
2. Not requiring to be frequently replaced.
3. As much elasticity in the material as may be useful in aiding the draught.
4. A firm and smooth surface.
5. Although comparatively smooth, to be free from slipperiness.
6. To afford sure foothold for the horse.
7. Not liable to be seriously affected by the changes of the temperature, or by repairs.
8. An absence of mud and dust.
9. A freedom from noise.
10. To afford economy in transit.
11. An economy in the construction and maintenance consistent with the preceding advantages.
12. Not subject to rapid abrasion.

The formation materials, or those under the actual street surface, should invariably be sufficiently solid and firm to withstand the pressure, unimpaired, of the heaviest traffic. The outer coating, be it composed of what material it may, is to protect the substratum, if I may so call it, and no surface will long remain in good order unless this substratum is substantial, firm, and unyielding, and the cause of its failure in London has been generally attributed to the very universal fault of a defective foundation, which is sooner found with wood than stone, in consequence of its less weight.

Wood may be considered more advantageous than stone from its resilient character, which helps to save the substratum from the effects of the loads passing over it.

I shall next consider the relative advantages of wood over stone, &c.; and, in the first place, may mention, that one inch of wood, used as pavement, is stated to average from fifteen to twenty years.

A paper was read, some years ago, by a Mr. Hope, before the Scotch "Society of Arts," when the writer went into a variety of details, to demonstrate what were the respective defects and advantages of wood and stone.

The result was, that wood was declared to be more durable than stone, and that the power of a horse is materially increased when acting on it, in consequence of its elasticity and evenness.

By experiment it was found that wood was the most efficient and durable material for paving, even when compared with stones of every description. The wooden blocks were placed with the fibre vertical, horizontal, and at intermediate angles, but when placed vertically they were found to answer best.

And with regard to durability, it is a well ascertained fact, that when wood and iron move in contact in machinery, the latter generally wears much more rapidly than the wood, which acts as a file on the surface it rubs against.

One writer states that it was proved that with a power of traction of 100 pounds weight, the weight drawn on a level macadamized road, on an average, is 27 cwts.; on a level granite pavement, 30½ cwts.; on a level wood pavement, 54¾ cwts.

Sir John Macneill, I find, from numerous experiments, has calculated the resistance to traction, on different kinds of roads, to be as follows:—

On a timber surface	2
On a well-paved surface	2
On a well-made broken stone road (dry)	5
On a well-made broken stone road (wet)	10
On a wet gravel or flint road	32

And by another writer, to whom I have before alluded (Mr. Hope), the following are stated as being the results of the power of a horse, with the same exertion, and the same rate of speed, on the following materials:—

On granite	34 cwt.
On a macadamized road	27 cwt.
On wood	50 cwt.

The weight on a macadamized road cannot be considered as a constant quantity, as he stated the same power will draw on it—

If smooth and in good order	34 cwt.
But after a shower of rain only	30 cwt.
And during a continuation of wet	23 cwt.
Or when laid with fresh broken stone only	10 cwt.

After a trial of 18 months, the following was the result of the wear and tear of granite and wood, and it will be seen that that of granite was nearly double that of wood, and that its wear decreases while that of granite increases:—

	WOOD.	GRANITE.
At the end of the 1st month	.017	.014
At the end of the 3rd month	.040	.037
At the end of the 6th month	.062	.073
At the end of the 9th month	.078	.112
At the end of the 12th month	.096	.141
At the end of the 15th month	.111	.183
At the end of the 18th month	.125	.218

About the time of the introduction of wood pavement into London a Practical and Scientific Association was formed, for the consideration of street pavements in general, and for the discovery and determination of the best materials wherewith to form them.

The leading objects of this Association were—

1stly. To form a collection of all the approved systems of making carriage ways.

2ndly. To collect and disseminate the most correct information regarding them.

3rdly. To invite the co-operation of men, eminent for their practical and scientific experience on the subject.

4thly. To protect inventors and patentees; and

5thly. To pursue such a course as would lead to the introduction of that pavement which, for its general utility and economy, shall be most deserving the approbation and support of the public.

I think the formation of a similar association in this city would be attended with very beneficial consequences.

Before I close my remarks on wood paving, I must observe, that the objection which has been chiefly urged against its use, indeed, I might almost call it the only objection, namely, its slipperiness in wet weather, does not apply to this colony; and in support o' this view I have made a comparison between this country and England, shewing the number of wet days here and at home, and the average temperature of both countries; for although I believe a much greater quantity of rain falls in the year here than in England, yet it appears that we have in England wet days in the proportion of three to one, compared to Sydney, and that the average temperature of Sydney is nearly 20 degrees above that of England. Nor must the total absence of frost and snow here be forgotten, for it was these, as well as rain, that combined to strengthen the objection to the use of wood pavement in London.

By the table annexed the number of days on which rain fell (omitting light showers)* in Sydney, in the year 1852, will be seen; also, a similar return for 1855, for England, and the totals are—in Sydney, 58; in England, 151.

The temperature, on an average, was at Sydney, about 64 degrees; and in England, 44 degrees.

Consequently the streets there a'ter rain would take a much longer time to dry, and the evaporation here is too well known to require me to allude further to it.

CAST IRON PAVEMENT.

I shall now briefly notice a description of pavement which I see has been introduced into London during the present year.

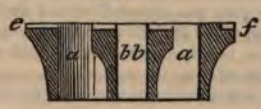
The inventor of this new pavement is General Knapp, o' the United States. The invention has been patented in Great Britain and Ireland, and the pavement has been experimentally laid down in Leadenhall Street, between St. Mary Axe and Aldgate, Cocks and Sons, of Tower Royal, being the contractors, and Rawsones and Simms of Ipswich, the founders.

The pavement consists of boxes made of iron and divided into sections, so small as not to admit the hoof of a horse, whilst the compartments of iron are so arranged as to strengthen one another and the whole pavement.

The boxes are grooved in such a manner as will effectually prevent the horses feet from slipping; the boxes are also keyed or linked together, and the interstices are filled with asphalt and concrete.

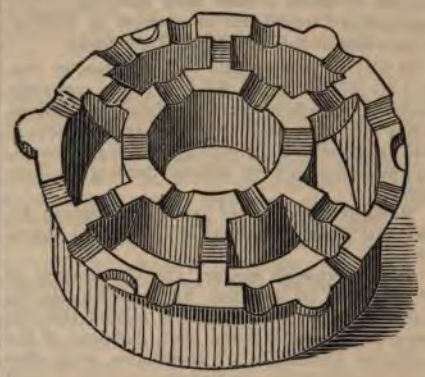
The boxes may be of different forms, but the circular box combines the greatest advantages with the fewest disadvantages. (*Figs.* 9 and 10 shew one of them.) It consists of a circle of cast iron 5 inches in height, about 1 inch in thickness at the top, and 12 inches in diameter, enclosing a smaller circle of the same height and thickness, and 5 inches in diameter.

Fig. 9.



a A circle of cast iron. *b* Inner or smaller circle. *e* Key. *f* Commissure.

Fig. 10.



The intermediate space between the outer and inner circle is divided into six sections by as many ribs of cast iron; every part of the boxes preserve the same thickness as at the top, for the distance of about 1 inch below the surface, and then gradually diminish in thickness towards the bottom.

The whole surface of the box is grooved, and at equidistant points, on the outer edge of the box, are three keys supported by shoulders, and set off to prevent the rims of the boxes from coming into immediate contact with each other; and at three equidistant parts are also three commissures for a key of the adjoining box to lie in.

The several keys of each box rest each in the commissure of the adjoining boxes, whilst the commissures in turn support each a key from one of three other boxes laid between the first three, and connected in the same manner with them.

Thus every box rests upon the ground, and is also supported by three other boxes, while it in turn is held down and kept firm in its place by three more boxes, which it also aids in supporting, thus giving great stability to the whole pavement.

A piece of this pavement was put down in Boston, in the Autumn of 1852 (in Howard-street), and more was laid the following year in Court-street, one of the most travelled parts of the city, and where it is said to have been thoroughly tested by a constant use of omnibuses and other heavily loaded carriages, and so far not one block has been broken, nor has the pavement in either street settled, or in any manner given way, although several new locomotives, which with the carriages on which they were transported weighed 30 tons, have passed over the portion in Court-street.

Two pieces have been also laid down in 1854, in New York, with equal success.

Some pavement of this description is said to have been tried in London as far back as 1836, at Blackfriars' Bridge.

One of the great advantages of General Knapp's pavement, urged by the patentee, is the facility of the removal of the blocks for gas, water, and sewerage purposes, with trifling expense.

CLEANSING.

The consideration of the best means of cleansing the streets of any large town, is of such great importance, and so closely connected with the subject of which I have been speaking in this paper, that I trust I will be excused in offering a few observations on it before I conclude.

It is of no modern date that this matter was first considered, for, in Ancient Rome, corporate bodies or civic functionaries existed, and *tribuni serum intertium* were appointed, whose duty it was to attend to the cleansing of the pavements, and punishments were inflicted for neglect in so doing.

Rewards were offered lately in England for the most approved method of keeping the streets clean.

In the sixteenth century the Government of France had to interfere to establish cleanly habits in the towns, and it is related that the royal residences of Spain were deficient of the common necessaries of cleanliness, even after they were found by our circumnavigators to exist amongst the tribes of the South Seas.

Warsaw can only boast of cleanly habits, it is said, within these last 20 or 30 years.

Berlin had its streets, though paved, kept so dirty, that a modern writer, speaking of this city in 1841 says—"It is a fine city, very like the age she represents, very fine and very nasty."

Let it not be said of this city of Sydney, for up to the present time I fear it could be said with some truth—that the civilization of an English village is after all more real civilization than that of Paris or Berlin, where the Fine Arts were advanced and the useful ones neglected, and where it was said that if the bronze and marble statutes of those cities could smell, they would be found holding their noses, instead of grasping their swords!

Thank heaven the days have gone by when it was necessary, as in Paris, to attend to the cry of *gare l'eau*, uttered three times, and to avoid the consequences; or even in Edinburgh, where, till 1750, whenever people went into the streets at night, it is related that "it was necessary, in order to avoid the disagreeable consequences from the windows, that they should have a guide, who, as he went along in front of them, called out in a loud voice in the Scotch dialect, "Haud your haunde;" they had also other strange habits, and nearly equally objectionable. For instance, that one which was accompanied with the cry of "Wha wants me for a Baubee?"

Mr. Heard mentions the wooden pavements of St. Petersburg as being kept scrupulously clean, and to answer well after having been in use 10 years.

It was said that pigs were allowed to roam in the streets of New York, and that no one would advocate any interference with these scavengers, lest they might forfeit the votes of their owners, in the attainment of municipal appointments.

Health should urge us, before any other reason, to attend much more than it is the habit to do, to cleanliness in our streets, &c.

Chambers' Journal records that, in Liverpool, pavements reduced the number of sick considerably in some of the worst parts of that town—in one court, containing 18 houses, the proportion was 18 before paving, to 4 since paving; and in another, 28 before paving to 5 since the paving. The facility of better cleansing came with the paving, and it was remarked that the health of the inhabitants in the worst parts was wonderfully improved, and that deaths were less frequent.

But in addition to health, the loss sustained from mud and dust in our streets, ought to be sufficient to urge every one to take measures to avoid, or at least lessen it as far as possible. The most exquisite gems of art, and the skilful labours of the house decorator, fall in their turn a prey to the destructive effects of mud and dust.

From enquiries made in London, in various parts, it appeared that the loss sustained by householders from mud and dust, varied from £10 to £100 per annum, and from £20 to £300 per annum by shop-keepers. The injury done to the goods of these people may be imagined, when I state that I was informed that in one establishment in this city they had lost between £500 to £600 of goods from the above causes, and another estimated their loss at a high per centage.

Mud and dust prevail most with macadamized streets, but even with wood pavement it is necessary to pay particular attention to this, and I think the best means to prevent an accumulation of them, and to keep the streets free from them, would be the general and constant use of street sweeping machines, one of which (Whitworth's), a patent self-loading cart, was, I believe, first brought into operation in Manchester, and was subsequently very generally adopted in Great Britain. I have noticed their operations in London, where with liquid mud an inch or more deep, a perfectly clean track was left behind these carts, about six feet wide, as they advanced drawn by a horse at a walk, and several of them working together soon left a clean street behind them.

The principle of this invention consists in employing the rotatory motion of locomotive wheels, moved by horse or other power, to raise the loose soil from the surface of the ground and deposit it in the vehicle behind.

The apparatus consists of a series of brooms, suspended from a light frame of wrought iron hung behind a common cart, the body of which is placed as near the ground as possible, for the greater facility of loading; as the cart-wheels revolve, the brooms successively sweep the surface of the ground, and carry the soil up an inclined plane, at the top of which it falls into the body of the cart.

The apparatus is said to be extremely simple, and not liable to get out of order, nor is the draught on the horse severe.

If the mud be thick on the streets it will fill itself in 6 minutes.

I fear that the subject of street cleaning has never been considered with the degree of attention here which it deserves, nor am I aware of what has been the average sum expended annually under this head.

It may probably seem strange that, in Manchester, within the township alone, the expense of scavenging was upwards of £5,000, (equivalent, say, to £20,000 here, per annum! so great was the importance attached to keeping the streets of that town clean.

Back streets and confined courts in all cities

require more frequent sweeping than the others; in fact, health demands especial attention to such localities.

I have now concluded my remarks on the different systems of street coverings, and have only again to reiterate my conviction that wood pavement is the most suitable of all those I have mentioned for the streets of this city, and that its adoption will be found to convey all the advantages attributed to it.

In London, upwards of 100,000 superficial yards of wood pavement was laid down, and the following particulars of its expense, which I have omitted to mention before, may be interesting to those who would wish to take the subject into their consideration.

The Wood Paving Company of London agreed, under the protective provisions of a Patent, to deliver their paving blocks at any seaport in the United Kingdom, at from 7s. to 7s. 9d. per square yard, and they were entitled to a royalty of 1s. per square yard for every yard laid down by any other person or company than themselves.

The following prices show their charges per square yard for blocks of different depths: three inch thick, 7s.; four inch thick, 7s. 3d.; five inch thick, 7s. 6d.; six inch thick, 7s. 9d., and so on, 3d. for each additional inch in thickness.

The cost of cutting I would estimate here at about one shilling per yard, or four times more than what it was in England.

"To enlarge greatly on the importance of wood paving," says a writer on this subject, "must now appear altogether unnecessary, the precision and skill with which it can be laid down and taken up, the strength of its construction, its extraordinary durability, the absence of all noise, the facility of traction, the diminution of mud in wet, and dust in dry weather, and the increased facility for its removal, its salubrity as regards the health of the public, and though last, not least, its superior cheapness over all other kinds of roads. All these advantages combined, tend to render it a pavement of peculiar eligibility."

In the present state of the streets of Sydney, it is true that its adoption in all the streets would not only be unnecessary, but also unwise, and lead to a useless expenditure of money. It should first be laid down in the principal streets, and there only in those parts where the water and sewerage works are completed, and where the surfaces would not be likely to be required to be broken up for these purposes, as it would be very liable to lead to unequal settlement in those parts of the pavement which had been removed from what had not been so.

All the different systems of pavements have each had their zealous advocates, contending for the adoption, and pressing forward the superiority of their respective systems. But the more proper course is, not to attach oneself to any particular system, to the prejudice of all others, but in endeavouring to discover the best, calmly to weigh the merits of each, and, from a candid and careful consideration of the whole, to determine the respective advantages of each, as it may be suitable for certain situations, regulated by local peculiarities and circumstances.

In this, as in all important undertakings, it were well to recollect that

> "Priusquam incipias opus est consulto
> Ac ubi consuluaris mature facto sit."

We are no doubt all of us well aware of the opposition, criticisms, and objections, that we see raised every day, when any improvement is suggested or alteration proposed in those things which are around us, and which, from being long accustomed to, or from a neglect of using our reasoning powers, we are disposed to imagine, as being "all that we require," if not perfection itself; and, at all events, preferable to any new-fangled invention or innovation. But this is nothing new. A writer in a scientific magazine, some years ago, said with truth, that the past history of science shows that few inventions have arrived instantly at perfection, and that, in the infancy of any new or striking improvement in the arts of life, there has ever been a numerous and annoying (though not a formidable) class of detractors, who, by magnifying real evils, and by conjuring up the most horrid imaginary ones, have raised a continuous and clamorous outcry against the "dangerous innovation." But experience likewise tells us that notwithstanding the opposition thus raised, and the difficulties (often purposely thrown in the way of improvements) ingenuity and perseverance have ultimately succeeded in removing all real defects.

In this paper I claim no credit for originality, nor do I advance any new theory, nor recommend untried improvements.

I do not press my own opinions on your attention, but rather those of the numerous authorities and writers whom I have quoted, and whose experience entitles them to every consideration.

Our object should be, in a new country like this, every day rising more and more into importance, and especially in a city such as Sydney, the metropolis of the Southern Hemisphere, here especially to avoid the errors of our predecessors at home, and to profit by their experience, or, in the words of a modern writer, "While we observe the faults committed by our ancestors in their designs, we shall at the same time learn to avoid them in our colonies, where we profess to bring the experience of civilized life to bear upon the wild desert, the boundless prairie, or the tangled jungle.

PHILIP D. VIGORS.

Sydney, December, 1856.

NOTE.—Writers referred to in the foregoing paper—Professor D. H. Mahon, U. S. M.A.; S. C. Brees, C. E.; *The Builder*; *The Philosophical Magazine*; Sir John McNeill; *The Mechanics' Magazine*; Edmund Leahy, on Roads, &c.; Law, on Road Making, &c.; *Chambers' Journal*, and the *Encyclopædia Britannica*.

[We venture to suggest to the Council of the Philosophical Society the propriety of pursuing the enquiry into the best mode of paving our streets. No time could be more appropriate than the present, when the public mind is thoroughly aroused to the importance of the question. The Society has funds lying idle in their hands, let them at once offer a reward of £100 for the best essay on the subject, accompanied by plans and estimates of the expense—the prize to be awarded by a Board composed of three professional engineers and two unprofessional gentlemen known to take interest in such matters. We are quite sure that a step like this would rouse the Philosophical Society from the languid state into which it appears to have fallen.—ED. *S. M.*]

* *Table, shewing the number of Days on which Rain fell at Sydney and London, for one year; also, the Temperature at both places.* *(Referred to at page 29.)*

SYDNEY, NEW SOUTH WALES.						NEAR LONDON.			
Months. 1852.	Wet Days.	Wet Nights.	Thermom.	Total Days and Nights Wet	Remarks.	Wet Days.	Average (13 yrs.) rain pr. month.	Average Thermom. 28 years.	Remarks. A.D. 1855.
			Deg.		Not including			Deg.	
JANUARY	..	..	75	..	Light showers fell 8 days.	5	4.38	37	* Also 8 days' snow.
FEBRUARY	1	3	74	4	„ „ „ 5 „	10	3.39	37	„ 7 „ „
MARCH	8	5	71	13	.. .. ..	14	2.52	..	„ some frost and snow.
APRIL.....	2	1	70	3	Light showers on 6 days.	9	1.83	47	
MAY	5	6	67	11	„ „ „ 4 „	14	1.69	48	
JUNE	8	1	54	9	„ „ „ 1 „	9	2.2	53	Nearly.
JULY	2	2	53	4	.. .. ..	17	2.4	55	
AUGUST	5	4	55	9	.. .. ..	10	2.9	55	
SEPTEMBER	6	2	60	8	.. .. ..	10	2.8	52½	
OCTOBER	7	2	64	9	2 (hail showers.)	23	5.0	47½	
NOVEMBER	10	1	69	11	With some light showers	12	4.2	43	
DECEMBER	4	5	71	9	.. .. ..	18	3.9	39½	
Total	58	32	..	90	.. Total	151	..	..	.. .. ..

* Memo.—In the week ending November 7th, 1856, 12.80 inches of rain fell at the Barracks in Sydney.

ON THE PRINCIPLES ON WHICH MR. WOORE'S WOOD GRATE IS CONSTRUCTED.

The following paper was read by Mr. Woore, at the meeting of the Philosophical Society, on Wednesday evening, December 10th, 1856:—

Heating the air in our dwellings adds so much to the comfort and health of man, that the best means of doing so has occupied the attention of scientific persons from an early date, and different plans have been adopted with various success; but as coal has been principally the fuel used, their attention has been directed to its consumption, and the result of the inquiries they have made has led to the general adoption of the well-known English register grate, in different forms.

In this colony, in the interior at all events, we are differently circumstanced, wood being invariably the fuel used, and some other contrivance is necessary to consume it, as the register grate is quite unfit for that purpose, and there does not appear to be any other applicable.

A suitable grate is therefore much required. No matter where the traveller goes in this colony, or how handsomely furnished the houses at which he visits, that one desideratum is invariably wanting: in lieu of the comfortable fireplace to which an Englishman's eye is accustomed, the naked bricks everywhere show their sooty faces in strong contrast with the surrounding neatness. And in many cases, that most abominable nuisance, "a smoky chimney," must be endured, as the present open fireplace, with its iron dogs, is as opposed to scientific principles in its construction as it is unsightly to view.

It is unnecessary to dwell on the many plans that have been proposed for heating rooms, or the principles involved in doing so; still, in offering to my fellow-colonists a grate for burning wood, suitable to our wants, it is necessary that I should travel over some beaten ground in explaining its construction.

The general principles of heat and air, on which the formation of fireplaces chiefly depends, are, that air is rarefied by heat and condensed by cold, or, in other words, that the same quantity of air takes up more space when warm than when cold; air rarefied and expanded by heat is specifically lighter than it was before, and will rise in other air of greater density, so that a fire being made in a chimney, the air about and over the fire is rarefied by the heat, then becomes lighter, and so rises in the funnel, and goes out at the top of the chimney.

The other air in the room flowing towards the chimney, supplying its place, is then rarefied in its turn, and rises likewise, and the place of the air thus carried out of the room is supplied by fresh air coming in through the doors and windows or, if they are shut, through every crevice with violence—or, if these are so closed up that little or no fresh supply of air can be obtained, the fire and current up the chimney must flag, and the smoke, no longer driven up, floats about the room.

When a fire is once lighted, the heat from it sets free the hydrogen and other gases in the wood, this hydrogen, as it is disengaged, takes fire, and being supplied with oxygen from the atmosphere, heats the carbon of the fuel to such an extent that it readily unites with the oxygen of the wood and of the atmosphere, and forms carbonic acid gas, which, being rarefied, ascends through the chimney and produces the foregoing effect.

This being the acknowledged principle on which the action progresses, in order to procure

an efficient grate adapted to our resources, it becomes necessary to apply it in such a manner that the machine will admit of our colonial hard woods burning freely, cause sufficient draught in the chimney to convey away the smoke (or unconsumed carbon) without carrying off more heat than was necessary to promote it, and to place the fire in such a position as shall admit of the greatest amount of heat being radiated or reflected into the room.

The oxygen of the atmosphere being a necessary ingredient in promoting combustion, it is evident the intensity of the fire will principally depend on the proportion in which it is introduced. Several experiments have, therefore, been made to ascertain the most effective means of doing so. And it has been found, that by placing the billets of wood immediately upon the hearth, without the iron dogs so generally in use, and causing the air to pass longitudinally between them with force, ignition and combustion take place most readily.

To effect this the billets must be laid on the hearth at right angles with the usual mode of doing so, *i. e.*, with one of their ends pointing outwards towards the centre of the room, that they may lie in the direction of the current of air, as it passes from the room to the chimney.

As has been shown, air rises in the chimney by being heated or rarefied, and the rapidity with which it ascends is determined by the degree of temperature it possesses; the more freely the fire burns and emits heat, the greater will be the elasticity given to the air immediately surrounding it; and the ascent of the rarefied air in the chimney will be proportionably great. And to supply this draught there must be a corresponding flow of cold air entering from the room. It is evident if this current is forced to pass through a small aperture in its way to the chimney, instead of being allowed to traverse the large space presented in the usual form of our fireplaces, its velocity will be materially increased; for, in so passing, the supply is not diminished, only confined in its transit; consequently, as the same quantity will pass in a given time, whether the opening is large or small, it must do so in the latter case with additional force, and the smaller the opening the greater will be its violence in the passage.

This current being dependent on the degree of heat, emitted from the fire, causing rarefaction, and the combustion in the fire depending on the force the current passes through it, supplying oxygen—each on the other—it is neccessary that the draught should not only be confined, but forced to pass as much as possible between the billets of wood.

These objects are gained by contracting the opening in the fireplaces at present in use, and forming them low down and immediately around the fire. The air will then be forced to enter the chimney through the space between the billets, or in immediate proximity to them—giving rise to a rapid combustion in the fire, by increasing the velocity of the air passing through it, thereby freely supplying the oxygen, and adding to the draught in the funnel by the intensity of heat, and by preventing any but rarefied air entering into it.

The difficulty in igniting and keeping up fires in the present open fireplaces, arising from the want of concentration in the draught, is partially obviated by the use of dogs, which admits the air beneath the wood. When there is a large quantity of fuel on them, combustion takes place rapidly, from the great heat emitted, being sufficient to rarefy all the air entering into the chimney, giving rise to a considerable draught within it notwithstanding the opening is so extensive; but as the wood is consumed, and the heat diimnishes, the cold air from the room enters the upper part of the fireplace without being rarefied; and condenses that within, as it rises from the fire, lessening its tendency to ascend, and consequently diminishing the draught in the chimney; the fire therefore languishes for want of nourishment, and, as the process extends, becomes extinguished, leaving the unconsumed billets extended like blackened bars across the dogs, unless attention in given to keep them alight.

(Mr. Woore here exhibited some coloured drawings in illustration of his theory. It will, however, be sufficiently apparent by paying a little attention to the text. We have not been able to procure them to engrave.)

A exhibits the action when the fire is burning moderately in the usual fireplace, the blue lines express the cold air, the red that has been heated or rarefied. The air heated by the fire rises freely to the flue; but it will be seen that the fire cannot have any great effect in heating that passing through the upper part of the fireplace, as it is so far removed from it, and therefore it enters cold; and immediately mingling with the warm, as it ascends from the fire, condenses it, and thereby checks its progress, rendering the draught slow and feeble; consequently, if there is any irregularity in the formation of the chimney, or if the external air is denser than usual, or there be other local cause, the current will not only be checked, but repelled into the room, bringing the smoke with it.

The drawing shows that in a chimney fitted with this grate, no cold air can enter the flue while the fire is burning; as whatever passes is confined to its immediate vicinity, and must be heated by it. And notwithstanding the fire is placed on the front part of the hearth (for reasons that will be hereafter shown), it will be seen that the current of air will not permit the smoke to ascend perpendicularly, but carries it back through the aperture into the flue; which, being occupied by nothing but rarefied air, the ascent is rapid and powerful. And if the flue is constructed of the same dimensions throughout, any check or return of the current would be contrary to the laws of nature.

In constructing a grate to secure these advantages the platform on which the fire reposes is cast in metal, two feet square; this is placed on the usual stone hearth, with its front edge in a line with the outer edge of the hearth, and fitted so closely to the hearth as to exclude the air from entering beneath it. At half its square towards the back, an arch is erected over the platform two feet in height, and from it extends to the rear, a vertical metal casing, fitted around the outer edge of the platform, which forms the back of the fire-place. On the back of the intrados of this metal arch a ledge is cast to receive the intrados of a brick arch, turned to correspond with the metal, which rests on brick jambs brought up on each side in contiguity with the metal.

The brickwork being extended on all sides, so as to occupy the whole space within the fireplace, with the exception of the metal archway, leaving but that space open for the air to enter the chimney, the air will thus be confined to the immediate vicinity of the fire reposing on the platform below. The entrance to the flue being between the soffit of the brick arch and the metal back of the grate—a small space corresponding with that in the register grate, which may be further diminished or closed altogether, as in that stove, by a metal lid hinged to the back.

From the lower part of the piers of the metal arch a balustrade is carried to the front on each side of the platform, terminating in two pyramids, with the object of confining the fire on the platform, and obstructing the air from entering at the sides, leaving the front open for its free passage between the billets, which, as before described, have been placed with one end pointing outwards to facilitate the contact of the oxygen contained in the atmosphere.

In this form of grate the fire will be found to burn very freely, and the draught to be so great as to carry off the smoke in the most defectively formed chimneys on all ordinary occasions, and from the fire being placed so much in the front, much heat cannot be drawn off by the current of air.

I erected the first of these grates in the dining room at Rossiville, where previously a fire could not be burned without filling the room with smoke, unless the door was wide open. A fire was lighted in it immediately after the setting was finished, when the masons' work was quite wet, and consequently the flue filled with damp air, notwithstanding which it drew off the smoke freely. I then had the top of the chimney closed for three-fourths of its space, when it still continued to draw well, but showed some symptoms of returning the smoke.

Having thus ascertained an efficient mode of making a fire from our colonial wood, it remained to determine the best method of disseminating the heat arising from it. Now, fire communicates heat by radiation, reflection, and conduction, in intensity as in the order here expressed, and heat which radiates in right lines is susceptible of being reflected. It has been ascertained that if a cannon ball, made red hot, be placed in the focus of one mirror, and an air thermometer in another, the rays of heat which impinge on one are reflected consistently with the property of concave mirrors in parallel lines, so as to fall on the opposed mirror, whence they converge to its focus, in which is the thermometer, which will be affected proportionably to the heat of the original radiating body.

The heat that emerges from our open fires radiates from the burning coals. One portion of the rays passes uninterruptedly into the room, whilst the other impinges on whatever body is contiguous. If that body possesses a bright and polished surface, the rays that impinge on it will be reflected according to the same law as light, namely, the angle of incidence is equal to the angle of reflection, but a portion of their heat will be absorbed, part of which will be again radiated, and part pass by conduction into neighbouring substances.

But if the body has a dull rough surface, the rays will then all be absorbed, and the principal part of the heat again radiated, as the body becomes heated in lines perpendicular to its surface, the remainder passing off by conduction into whatever substance adjoins, as above.

The object in placing the fire in the front part of the hearth is two-fold—first, that, as many of the rays radiating from it as possible may pass without interruption into the room, as they disseminate a greater amount of heat than either of those that are reflected or absorbed, and again radiated; secondly, to enable a reflecting or absorbing body to be placed behind the fire without interfering with the draught, that those rays taking a backward direction may be transmitted to the front.

Before heat can be radiated a second time, it must be absorbed, and rough unmetallic substances, such as bricks, are admirably adapted to this purpose. Various substances possess different powers of radiation, and those which are good radiators when hot, absorb heat quickly when cold. From Mr. Leslie's experiments, taking the radiating power of lamp-black at 100—crown-glass is 90—plumbago, 75—clean lead, 19—polished metals, 15, and sheet tin, 12—proving that polished metals are bad radiators, and not such good incipients of heat as those substances which are not metallic.

But metallic substances, when highly polished, so as to become good reflectors, freely throw back the rays that impinge on their surfaces by reflection; but to obtain this result the polish must be perfect, resembling the surface of glass—if not so—the metal not being a good recipient, and not having the property of reflection to any great extent, becomes comparatively a neutral body, neither transmitting heat by reflection or radiation.

Sir Humphrey Davy says, that vessels intended to retain their heat should be metallic, and highly polished upon scientific principles, independent of elegance and delicacy, and that those intended to absorb heat quickly, such as kettles and saucepans for culinary purposes, should be rough and black on their external surface to produce the greatest effect.

In the open fireplaces at present in use with straight jambs parallel to each other, where the fire is necessarily kept in the back part, to secure the ascent of the smoke, comparatively few of the rays radiating from the coals pass uninterruptedly into the room, as will be seen by the drawing marked C, which represents a plan of the usual open fireplace; the red lines expressing the direction the rays of heat take after leaving the fire. It will be seen, the greater portion of them are intercepted by the jambs, and these being absorbed by them, what heat is again radiated, being radiated perpendicular to their surfaces, impinges on the opposing jamb and does not leave the fireplace, but remains within it until conveyed up the flue by the draught. It is therefore desirable that the form of the surfaces lying in the neighbourhood of the fire on which the rays impinge should be altered, that the heat may be transmitted more effectually into the room.

Geometricians are sensible that all radii that set out from the focus of a parabola, and fall on its sides, are reflected back parallel to its axis. Therefore, by disposing a surface of polished metal (if such is used to occupy the space behind and

around the fire to diffuse the heat engendered in this grate in parabolic curves projected from the metal arch, and terminating at the extremes of the fireplace, on all sides, whose foci have a position among the burning coals, as much of the heat as can be will be reflected back parallel to the axis of the curve, and consequently be transmitted directly into the room.

But if a radiating body is used for transmitting the heat, it is desirable that the surface of the brickwork, already described, should be disposed in elliptical curves projected as above, that the rays radiating perpendicular to their surfaces may be dispersed more generally throughout the room.

I am not aware that the relative proportion in which heat is transmitted under the different processes of reflection and radiation has been ascertained, although various experiments have been made to determine the property different bodies possess in radiating and reflecting heat, and I have, therefore, endeavoured to come at the truth by the following means.

I had the space around this wood grate filled in with brickwork, the outer surface disposed in elliptical curves (as already described), plastered with lime putty, and painted with lamp black. I then had a reflecting surface made of bright sheet tin formed in parabolic curves, to fit as nearly as possible the same space; but capable of being removed at pleasure. Having had a fire lighted in the grate, when the whole became thoroughly heated, and the fire burning steadily, I placed an air thermometer four feet from the curved surfaces, the bulb being screened from the immediate influence of the fire. After repeated experiments, I found, on removing the reflecting surface of tin, but leaving the thermometer exposed to the influences of the rays radiating from the absorbing body of bricks, that the mercury invariably rose from five to six degrees, and fell in proportion on replacing them, clearly indicating that the amount of heat transmitted from a radiating body composed of earthy particles, whose surface was disposed in elliptical curves, exceeded by four or five degrees that transmitted from such a reflecting metallic surface as described, formed in parabolic curves. The slight variation in the temperature arising from the fire not being continually of the same degree of intensity.

Now, this reflecting surface of tin is, I conceive, of equal, if not of superior power to the ordinary polished metal surfaces attached to grates generally; and, as I am satisfied, a volume of earthy matter, from the peculiar facility it offers to absorb heat, becomes in time so warm, that it radiates heat to a greater degree than is reflected by any ordinary metallic surface, I come to the conclusion, that the space around the metal arch of this grate should be filled up with bricks, the outer surface being formed in elliptical curves, which, being neatly plastered with lime putty, and painted with lamp-black, would possess the form and substance capable of transmitting the greatest amount of heat into a room. And as it happens, this is the substance, which from its being easily procured and adapted to every form of our open fireplaces, is peculiarly applicable to the requirements of this colony.

I may also mention that another of the advantages this grate possesses is, that of the wood being burned in the ashes: the billets will in consequence remain unextinguished for many hours, when the fire is not required, but are capable of being lighted up again with facility. All bushmen know the value of the unexpiring properties of a fire in the ash-pit, which frequently remains smouldering for days.

To render this grate extensively useful, has been the principal object in its construction; therefore, all expensive ornaments have been avoided, nevertheless, it has a sufficiently neat appearance. It is capable of being safely carried to any part of the colony, removed from one fireplace to another, and may be set up by any ingenious man in the ordinary fireplace at a very moderate cost. It will be cast in three sizes, to suit different apartments, the largest, at present in use, not being applicable to small rooms.

CORRESPONDENCE.

To the Editor of the Sydney Magazine of Science and Art.

SIR—I am sorry to find that some remarks of mine which appeared in your May number, respecting Atmospheric Electricity, have been so entirely misunderstood by Mr. Jevons as to call from him a seemingly angry letter, in which he accuses me of misrepresenting his paper on clouds, and charging him with plagiarism. Had I so charged him I should have been guilty of the various absurdities and suppressions of truth pointed out in his letter; but as my remarks contained no such charge, direct or implied, I must simply plead not guilty, and make no attempt to justify the libel.

Mr. Jevons' investigations into the nature of clouds are not only highly ingenious, but, I am convinced, perfectly original; one of his conclusions, namely, that electricity has probably nothing to do with their production, lays no claim to originality, and it was to this conclusion only that my remarks applied when I stated that "Mr. Jevons's is no new theory."

It is probably new to many of your readers, and is decidedly opposed to popular opinion, yet, believing it to be true, I was glad to strengthen Mr. Jevons' position by adding to the testimony of Sir J. Herschel that of two such distinguished meteorologists as Kämtz and Schubler. Let me venture to suggest that, in all discussions on scientific questions, it would be well to lay aside personal feeling altogether, to give our opponents credit for good intentions and truthfulness, and to exclude such words as "misrepresent" from our vocabulary. From Mr. Jevons' second letter, I conclude that he has somewhat misunderstood my remarks respecting the review of "Geology and Genesis."

I said nothing of the "negative evidence against man's existence in earlier periods than that assigned in the Biblical account," but I did question his existence in any of the "earlier geological formations." Neither do I wish to be classed amongst those whom I described as regarding "the Bible as a revelation of physical science as well as of religion."

I am, Sir, yours, &c.,
W. SCOTT.

Observatory, Sydney, July 7, 1858.

To the Editor of the Sydney Magazine of Science and Art.

A singular example was afforded not long since in one of the Sydney newspapers, of the manner in which the wildest absurdities may be gravely circulated as established facts.

I allude to the method, stated to have been successfully adopted, of emptying the water from a ship's hold into the sea, by means of a syphon; the absurdity of attempting to raise water from a lower to a higher level by a syphon, though worthy of contradiction as appearing in a public journal, need not be pointed out to the readers of the *Magazine*, except as a warning against over credulity in matters pertaining to science.

W. S.

To the Editor of the Sydney Magazine of Science and Art.

(CONTINUED FROM PAGE 18.)

The darkness did not prevent ordinary print being read out of doors; but indoors, sempstresses were obliged to stop their work. Some sea-gulls, who were resting on little islets, rose in an agitated manner, and fled to land for shelter. This dark shadow could not have been very broad, for, at the time of greatest gloom, a spot on the horizon was seen in bright sunshine." Similar atmospheric effects were seen in the Isle of Wight; and even the curious effect of the clouds—seeming to come down upon you, which was promised by the astronomers, but seen nowhere else—was distinctly visible.

Mr. Glaisher, the meteorologist, took up his position at Oundle, in Northamptonshire, a place on the Central Line, and describes very similar effects to those observed in London. The cloudiness of the weather prevented the eclipse itself being seen; but the gloom, shortly before one o'clock, was very decided, resembling the approach of a heavy thunderstorm. There was a lull in the wind, followed by intermittent gusts, also reminding one of the approach of a storm.

Animals appear to have been affected as by the approach of evening—in many places—and cows came home to be milked, fowls came home to roost, cocks crew most perseveringly all through the darkest time (not merely on the return of light)—with what object it is difficult to guess. Birds were much disturbed all through the country; rooks were, everywhere, observed to come home; flocks of starlings took flight in an agitated manner; and we observed troops of sparrows, after an animated debate, taking shelter, and apparently going to roost in a thick tree. It is right to state, however, that one observer, Mr. Alfred Smee, declares that the birds he noticed went on singing and chirping without any intermission or variation.

Crocuses are described by more than one person, as shutting up; and by others, as changing to the colour of the pink hepatica.

Mr. Glaisher observes—and every one will confirm his remarks, that the degree of direct illumination appeared far more than commensurate with the amount of the sun's disc visible. Even up to the time of the greatest phase, when clear, the unobscured portion of the sun's disc emitted direct and divergent beams of considerable brilliancy, which marked out a luminous tract in the surrounding gloom, and was clearly and well defined in extent and figure. This is described by another observer as a singular broadway of light stretching north and south; and our own experience exactly accords with it.

When reduced to a slender crescent, the luminous portion of the disc was singularly white and silvery; the dark body of the moon appeared a sort of pewtery colour—not deep black.

The appearances known as Baily's beads, or globular bead-like protuberances, which have been observed previous to the completion of the ring in other annular eclipses, appear to have been seen by one observer at least—Mr. Fotheringay—who saw them like drops of water on the upper and under sides of the moon, occupying fully three-quarters of her circumference. As these are believed to be owing to the mountains projecting from the moon's surface, the conclusion has been drawn by Mr. Garbitt that the apparent ellipticity of the moon was greater than that of the sun.

Nowhere, however, were the "corona of silvery light," or "red flames," observed in former total eclipses (as in that of Sweden, in 1851) seen.

This paucity of remarkable phenomena need hardly lead us to conclude with one observer, Mr. Smee, that the stories usually told of eclipses are "results of overheated imaginations, or stories fit for an appendix to Baron Munchausen's wonderful adventures." It should be remembered, as Mr. Glaisher says, that "independently of the particular character of the day, the time of year was against the favourable witnessing of those effects which relate to the fluctuations of light, the form of shadows, the changing colour of the increasing gloom, and other kindred observations. We all know that in summer time the approach of a storm or dark cloud which should render it difficult to pursue any occupation, however trifling, would command immediate attention; while, in the ordinary dull days we suspend trifling businesses from want of light, without more than a passing consideration of the cause. The general feeling of disappointment as to the depth of gloom at the time of the greatest obscuration

is in part attributable to this cause, and partly to the veil of clouds which diffused by reflection part of the light they received. From all that I have been able to collect, I think it reasonable to infer that the great paucity of remarkable phenomena, even where the sun was visible, is owing to atmospheric conditions arising from climate, time of year, and unfavourable weather, and need not lessen our confidence in previous descriptions of the grandeur and beauty of the phenomena of large eclipses."

The only class of phenomena which were at all satisfactorily observed, were those relating to temperature and relative amount of light. A systematic and valuable series of observations on these points was made by the members of the Meteorological Society, in accordance with suggestions made by the Council.

From the classified account of these observations, given by Mr. Glaisher, it appears that the decrease of temperature was very considerable. In places north of the central line, the depression in the temperature of the air was on the average 2½ degrees; at points on or south of the line, nearly 6 degrees; being somewhat more than these numbers where the usual diurnal increase had taken place since the morning, and less where it had not. The diminution in the temperature of the ground, as shewn by a blackened-bulb thermometer was still greater, amounting to 12 degrees where the sky was quite overcast, and 17 degrees to 19 degrees where it was partially clear, but the temperature of the ground in all cases fell to that of the air during the eclipse.

The humidity of the air is shewn by the difference between the wet and dry-bulb thermometers. The former fell to 2.6 degrees less than the latter, in stations north of the central line; 3.2 degrees on the line, and 3.7 degrees south of it. At some places the humidity increased at time of greatest obscuration, but not universally.

The observations taken at Greenwich confirm these temperatures, at 9 a.m., 44½ degrees; at commencement of eclipse, 50 degrees; at noon, 50½ degrees; but from that time fell gradually, and by time of greatest obscuration was as low as 48 degrees 2 minutes, from that time gradually rose to 52½ at close of eclipse.

Mr. Love, of the Beeston Observatory, gives 47 degrees as the minimum and 49·5 degrees as the maximum temperature of the air; 4 feet from ground a blackened bulb or glass, showed minimum 46.3 degrees; maximum, 51.6 degrees; wet bulb, 4 feet from ground, minimum; 43.8, maximum, 45.5. The barometric variations were inconsiderable.

Strips of photographic paper exposed (at Greenwich) every five minutes, sensibly decreased in their shade of tint after 12.20, till the time of the greatest obscuration, five minutes before and ten minutes after which, they were hardly coloured at all. This seems at first sight to discredit the statement of the sudden increase of light immediately after the climax; perhaps the light at this time contained few chemical though many lumunious rays, or perhaps the change from darkness *seemed* more sudden than it was.

In the account presented to the *Academie* of France, it appears that the most remarkable circumstance noticed there was the sudden increase of temperature after the eclipse had reached its climax.

Mr. Alfred Smee made some valuable observations on the amount of light by an instrument which he calls his *abstract photometer*, which registers the amount of opacity necessary completely to stop light in degrees, each of which is equal to the opacity of $\frac{1}{100}$ inch of pure bromine, thus affording a valuable standard of comparison.

The amount of light reflected from the ground at commencement of eclipse, was estimated at 11 degrees, and gradually diminished to 8.5 degrees at 12.53; at 12.59 (climax of eclipse), it reached a minimum of 7.25 degrees; 2 or 3 seconds after one o'clock it rose to 10 degrees; and at 2.15 stood at 12.5 degrees.

The light from sky at commencement was 14.25 degrees; gradually diminished to 11.75 degrees at 12.50, and at one o'clock reached minimum of 9·25 degrees. At 1.2 it rose to 12.5 degrees; several seconds later than the rise of the illumination of the earth, so that the earth was for some seconds brightly illuminated with a dark canopy of clouds overhead, producing a marked and most peculiar effect, very different from ordinary darkness, and accounting to some small extent for the discrepancy noted above.

Some remarkable variations in the magnetic needle were noticed by Mr. John Yeats, of Fotheringay—"From an early hour in the morning till 20 minutes to 12, my compass manifested the usual deviation west, but from that time till 12 it advanced irregularly to the north. At 12.40 it had receded two points; at 1·6 p.m. it had recovered 1 point, but at 1.29 was due north again; before two o'clock resumed the position of early morning. The dip of the needle was also disturbed, and I am confident not from local causes."

The above is the valuable portion of all the accounts hitherto published, and they must be allowed to be rather disappointing. No one old enough to take deep interest in the eclipse just past can hope to see another of the same importance in England in his lifetime, and it is certainly disappointing, when (as Mr Lowe did) an astronomer has had a special set of instruments made, and a special train to convey them to the point of view to see really next to nothing. It may in fact be said that the public in general (represented to some extent by the *Times*) has lost a good deal of its faith in astronomers; let us only hope that before long it will be as easy to have a "special eclipse steamer" to the antipodes, as an *eclipse train* to Swindon; that mechanical science will make astronomical observers independent of the accident of locality.

F. P.

Letherhead, Surrey.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT SYDNEY, NEW SOUTH WALES.

For the Average results of Observations during Two Years—July, 1855—to June, 1857—see MAGAZINE, Vol I., page 46.

MONTH. — 1857.	PRESSURE OF AIR.				TEMPERATURE OF AIR.								MOISTURE.					RAIN.				
							HIGHEST.		LOWEST.		RANGE.											
	Mean Reading of Barometer at 32 Degs.	Pressure of Dry Air.	Highest Reading of Barometer.	Lowest Reading of Barometer.	Adopted Mean of Month.	Difference of Means.	of whole Month	of each day. Mean.	of each day. Mean.	of whole Month	of each day. Mean	Greatest of Month	Mean temperature of evaporation	Wet bulb below dry bulb.	Mean dew-point.	Mean tension of aqueous vapour.	Proportional humidity.	Total depth in inches.	Days of rain.	Mean extent of Cloud.	Thunderstorms.	Days of severe hot Wind.
JULY	30·103	29·792	30·38	29·45	51·4	1·4	68	62·0	42·3	30	19·7	38	48·4	2·3	46·0	·311	85	5·55	8	·42	1	0
AUGUST	30·167	29·850	30·50	29·69	51·5	·9	70	62·6	41·2	33	21·4	37	48·8	2·2	46·5	·317	85	4·56	12	·48	0	0
SEPTEMBER	30·033	29·715	30·37	29·74	55·2	— ·2	81	67·2	42·9	35	24·3	46	58·8	4·5	46·6	·318	73	1·54	7	·32	0	0
OCTOBER	29·928	29·528	30·23	29·50	60·3	—1·3	78	70·0	49·4	37	20·6	41	56·6	4·4	52·8	·400	75	5·26	14	·60	1	0
NOVEMBER	30·000	29·547	30·31	29·54	65·3	—1·2	88	75·9	53·4	41	22·5	47	60·5	5·4	56·2	·453	71	1·51	8	·36	2	1
DECEMBER	29·991	29·463	30·24	29·60	69·1	—1·1	108	78·2	58·9	49	19·3	59	64·5	5·2	60·5	·528	73	1·26	8	·55	2	3
1858.																						
JANUARY	29·930	29·344	30·23	29·22	73·3	— ·7	108	84·1	61·8	54	22·3	54	67·8	5·9	63·5	·586	70	1·16	6	·55	2	3
FEBRUARY	30·074	29·541	30·31	29·57	69·9	— ·6	87	80·2	59·0	49	21·2	38	61·8	5·4	60·8	·533	71	1·31	8	·48	1	0
MARCH	30·125	29·597	30·48	29·76	67·7	— ·2	82	76·8	58·4	50	18·4	32	63·7	4·1	60·5	·528	77	3·74	12	·43	1	0
APRIL	30·169	29·710	30·48	29·82	62·5	— ·2	81	71·9	52·8	44	19·1	37	59·4	3·4	56·6	·459	83	5·02	13	·50	1	0
MAY	3 ·084	29·713	30·43	29·77	56·4	1·3	78	67·0	47·2	37	19·8	41	53·2	2·6	50·8	·371	84	11·85	12	·37	0	0
JUNE	30·177	29·871	30·51	29·80	51·5	1·3	66	61·5	42·8	34	18·7	32	48·3	2·5	45·6	·306	83	5·94	14	·45	0	0
MEANS	30·065	29·639	30·37	29·62	61·2	— ·1	82·9	71·4	50·8	41·1	20·6	41·8	57·2	4·0	53·9	·426	77·5	48·70	122	·46	11	7
Averages of Three Years. JULY	30·097	29·813	30·38	29·52	49·1	+2·2	68	60·8	39·5	31	21·3	37	45·8	2·2	43·5	·284	86	3·39	10	·40	1	0
AUGUST	30·113	29·821	30·49	29·65	51·4	+1·6	76	64·6	39·7	31	24·9	45	47·5	3·1	44·3	·292	80	1·94	7	·30	0	0
SEPTEMBER	30·044	29·716	30·38	29·64	55·9	+ ·2	81	67·8	44·2	35	23·6	46	51·5	4·3	47·4	·328	75	3·16	9	·38	1	0
OCTOBER	30·008	29·621	30·43	29·53	60·6	— ·7	86	71·2	49·4	39	21·8	47	56·1	4·9	51·9	·387	72	3·09	12	·53	1	1
NOVEMBER	29·957	29·524	30·30	29·49	64·8	+ ·8	92	75·3	53·4	43	21·9	49	59·5	5·7	55·0	·433	70	4·56	10	·51	2	2
DECEMBER	29·954	29·457	30·28	29·62	67·4	— ·4	97	76·7	57·7	46	19·0	51	62·7	4·9	58·8	·497	74	3·16	12	·61	3	1
JANUARY	29·941	29·428	30·32	29·45	71·0	— ·6	100	80·9	60·4	52	20·5	48	65·9	5·4	61·8	·553	71	2·57	10	·56	2	3
FEBRUARY	30·039	29·484	30·32	29·64	70·1	+ ·1	94	79·5	60·7	51	18·8	43	65·4	4·6	61·9	·555	75	3·44	11	·59	1	1
MARCH	30·115	29·561	30·44	29·72	68·1	— ·2	85	76·8	59·3	49	17·5	36	64·7	3·5	61·9	·554	80	4·01	12	·51	2	0
APRIL	30·167	29·692	30·49	29·70	63·2	+ ·9	83	73·0	54·4	45	18·6	38	60·0	2·8	57·6	·475	84	5·25	13	·49	2	0
MAY	30·144	29·791	30·46	29·79	55·2	1·4	73	65·7	46·0	36	19·7	37	51·9	2·6	49·4	·353	83	7·11	12	·41	0	0
JUNE	30·631	29·743	30·36	29·62	50·6	1·6	66	61·5	41·4	33	20·1	33	47·0	2·8	44·0	·288	81	3·93	11	·39	0	0
MEANS OF THREE YEARS	30·054	29·637	30·39	29·61	60·6	·4	83·5	71·1	50·5	41·0	20·6	42·5	56·5	3·9	53·1	·417	77·6	45·61	129	·48	15	8

N.B.—The observations were taken throughout, as for the accompanying Monthly Report.

The last line of the above Table contains the final average results of three years' observations. Thus, the mean temperature of the air in Sydney is 60·6 degrees; the mean daily range, from 50·5 degrees to 71·1 degrees; the mean height of the Barometer is 30·054 inches; the total depth of rain, 45·6 inches; the number of rainy days, 129; the mean dew-point, 53·1 degrees; the mean extent of sky covered by cloud ·48 (or ½) and so on.

METEOROLOGICAL REPORT.

SYDNEY, MONTH OF JUNE, 1858.

FROM OBSERVATIONS TAKEN AT 9 A.M. AND 9 P.M. EACH DAY.

June, 1858.	Barometer Reduced, &c.	TEMPERATURE OF AIR. Mean of 9 a.m. and 9 p.m.	Maximum.	Minimum.	Range.	MOISTURE. Dew point.	Rain. Inches.	Sun's Heat. Degrees.	CLOUD. Extent.	Form.	WIND. General Directions.	REMARKS ON WEATHER, ETC.
1	29·832	57·6	65·9	41·8	24·1	43·7	·0	83	6	Cu.	West.	Strong wind.
2	30·023	48·4	63·8	42·8	21·0	41·5	·0	81	0	..	SW.	Fine and clear. Moderate breeze.
3	·147	47·4	62·3	38·6	23·7	41·3	·0	85	0	..	SW.	
4	·195	50·2	61·2	37·3	23·9	43·0	·0	75	2	Cu.-Cu.-St.	WSW. S.	Banks of clouds.
5	·222	50·0	59·2	41·3	17·9	43·4	·08	73	3	Cu.-Ni.	South.	Showers.
6S	·256	48·2	61·1	42·3	18·8	44·6	·03	78	5	Cu.	WSW. SE.	Clearing.
7	·237	52·3	65·1	38·3	26·8	47·7	·0	92	0	Ci.	Calm. N.	Calm and delightful weather.
8	·157	45·7	65·4	36·3	29·1	43·2	·0	92	0	Ci.	West.	
9	·005	52·4	62·7	34·8	27·9	39·5	·0	91	3	Ci.-Cu.	WNW.	Strong dry wind.
10	·118	50·5	62·8	37·3	25·5	38·4	·0	85	0	..	WSW.	Cloudless sky.
11	·215	45·7	64·2	40·3	23·9	39·3	·0	84	0	..	SW.	
12	·306	49·4	64·4	38·3	26·1	44·0	·0	84	0	Cu.	WSW.SE.	Fine.
13S	·450	52·8	62·8	46·3	16·5	48·8	·38	77	3	Cu.	SE.	Showery cumuli.
14	·487	50·8	60·4	45·0	15·4	49·1	·10	75	5	Cu.	South.	
15	·370	52·3	56·6	45·3	11·3	51·0	·93	61	10	Cu.-Ni.	South.	Very rainy.
16	·239	53·9	59·1	50·7	8·4	50·9	·48	75	10	Ci.-St.-Ni.	South.	Much cirrostratus.
17	·053	54·5	58·8	51·0	7·8	53·2	·64	71	8	Ci.-St.-Ni.	South.	Drizzling rain.
18	·062	53·4	62·0	51·3	10·7	50·4	·08	78	5	Ci.-St.-Cu.	South.	Clear dewy night.
19	29·985	58·0	64·4	47·3	17·1	52·1	·0	90	6	Ci.-Cu.	West.	Fair.
20S	·814	54·3	65·8	42·8	23·0	45·4	·08	87	3	Ci.-Cu.-St.	NW.	Thunder cloud.
21	·909	49·2	62·6	37·3	25·3	40·7	·0	80	0	..	WNW.	Fine and cloudless.
22	·985	50·7	63·6	34·3	29·3	42·5	·17	80	4	Cu.	WSW.	Showers of rain.
23	30·335	52·9	60·8	48·0	12·8	48·7	·22	85	6	Cu.-Ni.	South.	
24	.412	47·5	62·5	47·0	15·5	45·6	·0	89	4	Cu.	Calm.	Clear night. Mist.
25	·350	44·6	58·0	36·3	21·7	42·6	·0	65	5	Ci.-St.	West.	Halo and haze.
26	·371	45·3	57·8	39·0	18·8	42·5	·0	71	9	Ci.-St.	West.	Haze of Ci.-St.
27S	·264	50·6	61·0	40·0	21·0	47·6	·0	70	10	Ci.-St.	Calm.	Thick gloomy sky.
28	·184	53·8	58·3	49·3	9·0	51·3	·24	63	10	Ci..St.-Ni.	Calm.	Very threatening.
29	·061	53·4	56·0	52·3	3·7	52·0	1·25	59	10	Ci-St-Cu-Ni.	SSE.	Constant rain.
30	·267	49·6	57·4	50·0	7·4	47·0	1·26	66	8	Cu.-Ni.	SSE.	Heavy showers.
..	30·513	58·9	65·9	..	316	54·6	1·26	92	10	Highest of single readings		
..	29·804	40·9	..	34·3	..	37·5	..	..	0	Lowest at 9 a.m. or 9 p.m.		
..	30·177	50·8	61·5	42·8	18·7	45·6	5·94	78·2	.45	Means and Sums, June, 1858.		
..	29·958	49·4	61·5	40·7	20·8	43·2	2·93	..	·36	Means and Sums, June, 1856-1857.		

N.B.—The observations are *not* corrected for diurnal range. The principal instruments have been compared at Greenwich, and the readings are all reduced accordingly.

Pressure.—The barometer is 11 feet above the sea-level. The greatest range of pressure is ·709 inches. The barometer was at the great height of 30·513 inches, at 9 a.m. of 14th.

The mean gaseous pressure of dry air is 29·871 inches. The average weight of a cubic foot of atmospheric air is 545 grs., for the month.

Temperature of Air.—The mean of all self-registered maxima and minima is 52·1 degrees. The *adopted mean temperature* of the month is, therefore, 51·5 degrees Fahrenheit. The corresponding mean result for the two previous years (June) is 50·2 degrees.

Moisture.—The dew-point is calculated from readings of Negretti's and Zambra's dry and wet bulb thermometers, by the use of Glaisher's tables. 2nd Edition.

The mean temperature of evaporation at 9 a.m. and 9 p.m. is 48·3 degrees. The mean elastic force of aqueous vapour is ·306 inches. The average proportional humidity of the air is denoted by 8·3, perfectly dry air being taken as 0, and saturated damp air at 100.

Rain.—More or less rain fell on 14 days during the month, the total depth being 5·94 inches. The rain is collected at one foot above the ground, and measured at 9 p.m.

Sun's Heat is indicated for each day by the highest reading (self-registered) of a thermometer with a blackened bulb, placed one inch above the ground.

Cloud.—The extent of cloud is expressed by the tenths of the whole sky covered by it.

The forms of clouds are denoted as follows, the number of days on which each kind occurred being added in figures.

Cu.	Cumulus 16	Ci.-Cu.	Cirro-Cumulus 1
Ci.	Cirrus... 4	Ci.-St.	Cirro-stratus 8
St.	Stratus.. 1	Cu-St.	Cumulo-stratus 1
		Ni.	Nibus..8.

Ozone —The mean monthly amount of Ozone is — by day 3·1 degrees, by night 3·7 degrees.

Winds.—The winds may be thus summed up.

North ..... ½	days.	SW 3	days.
NW 1	„	South.....7½	„
WNW 2	„	S-E 2	„
West 5	„	SE 2	„
WSW 3½	„	Calm 3½	„

W. S. JEVONS.

Double Bay, near Sydney, N.S.W.

Registrar General's Office,
Sydney, 8th July, 1858.

HEALTH OF SYDNEY.

The number of deaths registered at the Central Office during the month of June is 160, viz.:—93 males and 67 females; the most fatal diseases have been those of the "Respiratory and Nervous Systems."

The number of Deaths registered during the corresponding month of last year was 91, and in 1856, 104.

The number of Births registered during June is 220, viz.:—113 males and 107 females, being 60 in excess of the Deaths.

Births Registered during Quarter ended 30th June,	1856.	1857.	1858.
April	111	219	211
May	160	204	200
June	155	218	220
Total	426	641	631

Deaths Registered during quarter ended 30th June.	1856.	1857.	1858
April	129	94	115
May	131	90	126
June	104	91	160
Totals	364	275	401

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1ST TO 30TH JUNE, 1858.

CAUSES OF DEATH.	Under 1 Year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages.
ZYMOTIC DISEASES. Endemic, Epidemic, and Contagious	6	2	2	..	3	13	6	..	1	..	2	1	1	2	..	..	1	..	..	..	..	..	..	..	..	..	27
SPORADIC DISEASES. *Of Uncertain Seat.* — Dropsy and other Diseases of Variable Seat ..	11	3	1	..	..	15	..	..	..	..	1	1	..	..	2	..	2	..	..	..	..	..	..	..	..	..	21
Of Nervous System.—Diseases of the Brain, &c.	19	3	2	..	..	24	..	..	1	..	..	..	..	1	4	1	2	..	..	..	..	..	..	..	..	..	33
Of Respiratory System.—Diseases of the Lungs, &c.	11	8	2	2	1	24	..	1	1	3	3	3	2	2	1	1	2	1	1	..	..	..	..	..	..	..	45
Of Circulatory System.—Diseases of the Heart and Blood Vessels.....	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	2
Of Digestive Organs. — Diseases of the Stomach, Liver, &c.	3	4	2	..	1	10	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13
Of Urinary Organs.—Diseases of the Kidneys, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Of Generative Organs	..	..	..	..	..	..	1	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
Of Locomotive Organs. — Rheumatism, Diseases of the Bones, Joints, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1
Of Integumentary System.—Diseases of the Skin	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Old Age	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	1	1	..	..	..	..	..	4
External Causes. — Violence, Privation, and Intemperance	..	1	..	..	..	1	..	..	..	..	1	3	..	..	..	1	..	1	1	..	..	..	..	..	..	..	8
Unspecified	1	2	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
DECEASE, Total, from all Causes	51	23	9	2	5	90	7	2	3	4	11	8	3	5	8	3	8	3	2	1	1	1	..	..	..	..	160

CHRIS. ROLLESTON, Registrar General.

THE PANAMA ROUTE.

As a rule, we have resolved to avoid any question having a political bearing in these pages. The question of the route by which the mails from England should be conveyed to these shores cannot, we suppose, be considered to partake of this character, although it was the subject of a long and interesting debate in the Legislative Assembly, on the evening of Friday last, August 7th.

On this occasion the House adopted, by a very large majority, the following resolutions, with which, we beg to say, we entirely concur:—

1. That the experience hitherto gained of steam communication between Australia and England, *via* India, has led to general disappointment and dissatisfaction in this colony.
2. That any new arrangement for the performance of the Mail Service by the India route, though it ensured postal regularity, and speed, would confer no other considerable benefits on New South Wales, while it must necessarily place this community, as the last point of intercourse in the Australian system, at a permanent disadvantage in relation to the Southern Colonies.
3. That it is in the highest degree necessary that immediate steps should be taken to prevent the public inconvenience and injury which would result from a total stoppage in the Mail Service, with which the colonies are at present threatened; and that the interests of New South Wales would be best promoted in this emergency by opening communication with America and Europe, *via* the Isthmus of Panama.
4. That there are reasonable grounds for believing that a line of steamers of the requisite power and capacity, running between Sydney and Panama, in addition to the advantages of regular postal communication, would induce a spontaneous and valuable passenger traffic to these shores, from the large numbers of persons constantly arriving on the Isthmus from the United States, British North America, and the West Indies, as well as from the countries of Europe, and from the communities of Anglo-American origin on the Pacific.
5. That in coming to a right determination on this subject, the question of cost is not the first for consideration, but that the efficiency of the service to be performed should be secured beyond probability of failure, and that especial regard should be had to those social and commercial consequences which would tend most to the progress and prosperity of the colony of New South Wales.
6. That an address, embodying the foregoing resolutions, be presented to the Governor-General, praying that his Excellency will be pleased to bring the subject under the early consideration of the Executive Government.

We have long felt convinced that the Panama is the route that ought to be adopted by this colony, and we shall justify our opinion by the following considerations, and offer a suggestion which appears to have been overlooked in the discussion of this question.

The first resolution does not go far enough when it states "that the experience hitherto gained by steam communication between Australia and England, *via* India, has led to general disappointment and dissatisfaction in this colony." The route *via* the Cape of Good Hope was equally disappointing and disastrous. In fact, both these routes have utterly failed, not only in conveying the mail in the stipulated time, but in offering inducements to emigration, which, after all, is the chief thing we ought to look to. It was well stated in the debate, that the Indian route could never offer the attractions of cheapness and comfort to intending emigrants; and, further, that the countries that it traversed did not supply the kind of population that was calculated to benefit the colony.

On the foregoing grounds, therefore, the Panama route was considered desirable, and the fourth resolution, it will be perceived, affirms the high probability of its attracting a large immigration, supposing that a line of steamers, of the requisite power and capacity, were established. We must confess that this is a great point to premise. When we consider the great distance that a steamer would have to run, and the large amount of coal she would be compelled to carry, we look around on the performances of all the ocean steamers with which we are acquainted, and cannot find any one that possesses the necessary characteristics. The distance from Panama to Sydney is stated to be 7839 miles, and any vessel should be able to carry coals for the entire distance, if delays for coaling are to be avoided. There is, we believe, only one vessel yet built that is capable of doing this, and that is the monster steamer the Leviathan, which, at the latest dates, was lying in the Thames. Now we shall probably be regarded as very visionary and very absurd, when we state that we believe that the voyage from Sydney to Panama is the very best route that this magnificent vessel could be engaged upon.

If she fulfils the expectation formed of her, she would perform the distance in sixteen days, that is at the rate of 20 miles

per hour. Now, if we allow sixteen days for the passage from England to the other side of the Isthmus, with a few hours for the crossing the 46 miles of land by railway, it will be seen that we have here a passenger route by which England may be reached in about one month. But it must be remembered that in a very short time (perhaps before these lines are written) there will be electric telegraphic communication between England and America. The line of wire has already been extended to New Orleans, from whence it will, doubtless, stretch to the West Indian Islands, so that an unbroken chain of communication may easily be conveyed from Panama to England. If this is effected, and it is most probable it will be, we should, supposing that our suggestion is carried out, actually be able to receive intelligence in about sixteen days from England.

We really do not see any impossibility in the above speculation. We cannot think of any more paying line that the Leviathan could be put upon. To the colony such a means of communication would be beyond all price. For a monthly mail in thirty-five days it could afford to pay any subsidy. We, at present, for the miserable mockery of a mail service that we have, pay, in conjunction with England and Victoria, the ample subsidy of £180,000 per annum; and will it be supposed, that for such very much greater advantages the colonies would grudge to give this, or even a much larger sum? Besides this, when we consider the wandering and enterprising habits of the American people, and the vast amount of traffic there is at present crossing the Isthmus of Panama, it is only fair to conclude that a vessel of this kind, that would bear them at unprecedented speed, and with matchless comfort to a golden colony, would command such a crowd of passengers as had never previously been heard of in the history of the world. The Pacific, then, is the true field for this latest effort of human ingenuity, and we fervently hope that the experiment will be made, feeling assured of its success. Then New South Wales would assume her proper position as the first of the Australian colonies, and Sydney would at once become the metropolis of the Southern Hemisphere.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

NINETEENTH MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange.

Tuesday, August 3, 1858.

Members of Council present:—His Excellency the Governor-General, President; Messrs. J. Dyer, Burnell, F. Creswick, T. Walker, J. Black, P. L .C. Shepherd, Dr. Houston, and several members and their friends.

The President in the Chair.

MINUTES.

Minutes of the last meeting read and confirmed.

PAPERS READ.

The Secretary read a paper from Mr. Henry Badgery on the Cultivation of the Potatoe.

The President remarked that he had tried some experiments in Hobart Town with potatoes, and found where they were planted in rows, three feet apart, the plants were larger, but the weight per acre was greater when they were planted thicker, though the potatoes were much smaller.

The President read a paper from Mr. Edwin Hickey, F.R.G.S., on a Stumping Machine, which was illustrated by a plan.

Mr. Hemming stated that there was an American Stumping Machine at work at Burwood, and that he had seen stumps two feet through pulled out with it. The force applied caused the chains used to be broken and the hooks straightened, so that the owner had to get them replaced by much heavier materials. On the whole, the machine did not answer, and burning out was found much more efficacious and cheaper.

Mr. Dyer observed, that Mr. Want had tried an American machine, but without success.

The President remarked that the American trees were not so large, or the ground so hard as in this colony, and the machine made by Mr. Hickey could be purchased for about one-third of the American, and that it would be an advantage to any person wishing to construct one of the machines, to have the patterns for the iron work lent to him, as promised by Mr. Hickey.

Paper read by Mr. F. Creswick, on the Aphis affecting the Cabbage Tribe.

The President said that he would certainly try the experiment mentioned by Mr. Creswick, and asked him if he thought the remedy would be found so efficacious as to prevent the return of the insect.

In reply, Mr. Creswick stated that he believed it would.

Mr. Hemming spoke of Mr. Reynolds, at Burwood, rubbing sand or soil on the plants affected with success.

The President remarked that he had seen the same thing done to apple trees in Hobart Town, that were infected with the blight, with the same beneficial result.

Mr. Thomas Walker thought the climate of this colony favoured their production, and would ask Mr. Creswick if he did not think the preparation he suggested would stop the pores of the leaves and thus hinder the growth of the plant.

In answer to Mr. Walker's question, Mr. Creswick said he did not think it would, and that he thought the blight, which was troublesome at the present time, had been in the colony for several years past, and which he had found attack some kind of cabbages more than others.

Mr. Joseph Dyer read a paper from Dr. Gunst on the Sorghum Saccharatum, and the manufacture of Sugar from it.

The reading of Mr. W. Redman's paper on the same subject was postponed, together with Mr. Markham's paper on Meteorology, to the next meeting.

A vote of thanks was proposed by Mr. Thomas Walker, and seconded by Mr. W. Redman, to the writers of the various papers which had been read during the evening, which, on being put from the Chair, was carried by acclamation, and conveyed by the President to the authors of the papers present.

The President drew the attention of the meeting, to a very fine specimen of the Rio Pumpkin, which had been laid upon the table by Mr. John Gay, measuring 3 feet 6½ inches in length, and weighing 39lbs. 13ozs.

CANDLE NUTS.

The Secretary laid a quantity of Candle Nuts, and a quantity of a kind of Dolichos seed upon the table, which he stated had been presented to the Society by a gentleman who had collected them in New Caledonia, and desired that they should be distributed among the members of the Society.

Dr. Gunst, who had resided some time on the Island, informed the meeting that the nuts contained about 75 per cent. of essential oil, of a beautiful quality, which burned without giving off smoke, and that the natives run a string through a number of the kernels, which answered as a candle, giving a very bright light; he also stated that the nut when eaten raw was aperient and poisonous.

The tree afforded a delightful shade, and was of a very elegant appearance; in some cases he had seen the nuts laying four feet thick under the trees.

One of the nuts, on being lighted, in the room, gave a very bright light: it burns from 8 to 10 minutes.

NOTICE OF PAPERS FOR NEXT MONTH.

Mr. W. Redman, on the "Sorghum Saccharatum."

Mr. T. W. Shepherd, on native plants, and the Horticultural, Agricultural, and Pastoral Resources of Australia.

Mr. Lewis Markham on Meteorology.

The next monthly meeting will be held on Tuesday, September 7th.

COUNCIL MEETING.

PURSUANT TO CIRCULAR.

Held in the Society's Rooms, Tuesday, July 27, 1858.

Present:—Messrs. Thomas Walker, J. Dyer, J. Graham, Burnell, M. Guilfoyle, P. L. C. Shepherd, G. H. Rowley, F. Creswick, Wm. M'Donnell, W. Carron, D. Mc Innes, T. W. Shepherd, John McDonald, and Dr. Houston.

Dr. Houston in the Chair.

Minutes of last meeting read and confirmed.

Letter read from Mr. Taylor, Adelaide, and a copy of the *Farm and Garden*, newspaper, laid upon the table.

Proposed by Mr. W. McDonell, seconded by Mr. J. Dyer,

That Mr. William Deane be requested to continue the office of Honorary Secretary: carried unanimously.

Proposed by Mr. P. L. C. Shepherd, seconded by Mr. Burnell,

That Mr. John McDonald be requested to accept the office of Honorary Treasurer: carried unanimously.

The following Committees were appointed:—

Exhibition, Experimental Farm and Garden, Finance, Bye-Law, and Publishing.

It was resolved, on the motion of Mr. T. W. Shepherd, seconded by Mr. W. McDonell,

That the Secretary be instructed to enclose the resolution arrived at, at the last general meeting, regarding amalgamation with the Cumberland Agricultural Society, to the committee of the said Society, and to request that the committee will communicate to this Society their views upon the subject.

The Secretary was instructed to have two thousand copies of the report printed, and to supply the proprietor of the *Sydney Magazine of Science and Art* with a sufficient number for the issue of that journal.

The following motions were referred to the bye-law committee:—

That one month's notice be given in writing to the Secretary, of any proposition to be brought before any general meeting, other than the regular business.

That all resolutions shall be made in writing.

The following notice of motion was given by Mr. T. W. Shepherd, to be proposed at the next Council Meeting:—

That a deputation of two of the Council shall be appointed to visit such towns in the interior, as the Farm and Garden Committee may advise, and that their travelling expenses be paid by the Society.

Notice of two vacancies in the Council, through the appointment of the Honorary Secretary and Treasurer, having been given, the following gentlemen were proposed to fill them, the election to take place at the next Council Meeting:—Messrs. E. K. Silvester, H. Waymouth, D. Willson, Ainsworth, and J. G. McKean.

Accounts passed.

The Annual General Meeting of the Society was held on Tuesday evening, 20th July, at the Chamber of Commerce, Sydney Exchange.

His Excellency the Governor General, President, in the Chair.

Minutes of last meeting read and confirmed.

The Secretary read the following Report.

SECOND ANNUAL REPORT OF THE AUSTRALIAN, HORTICULTURAL, AND AGRICULTURAL SOCIETY.

THE Council in placing the second annual report before the members, have much pleasure in congratulating them on the present flourishing state and future prospects of the Society, which may now be considered as established among the useful and scientific institutions of the colony, and one in which the public evince great interest, as shewn by the large attendance at the exhibitions, and the desire evinced for the establishment of an experimental or model farm—garden. With reference to this highly important object, it will be seen by last year's report that a suggestion was made in the report of the committee for the establishment of an experimental farm and garden, of the propriety of obtaining specific contributions for the purpose. In order that the Council might arrive at some idea of the amount required, the President kindly undertook to have plans and specifications prepared of the requisite farm buildings, which have been done gratuitously by Alexander Dawson, Esq., and for which the Council have accorded him a vote of thanks.

The committee appointed also went carefully into the matter with reference to the stock and machinery, and found that the sum which would be required to commence operations might be set down at something like £10,000. The Council then decided on making an appeal to the public of New South Wales, which they have had printed, together with the ground plan and bird's eye view of the buildings, forwarded to all the members, and being forwarded throughout the colony. A copy of the appeal is appended to the report.

It occurred to the Council that the most fitting way of bringing the subject before the public would be its introduction at a public dinner given under the auspices of the Society. Accordingly the necessary arrangements were made, and the dinner held in the hall of the Sydney School of Arts, on the 27th May. His Excellency the Governor-General presiding on the occasion, and the sum of £897 15s. subscribed in the room.

Subscription lists have since been sent to most of the country members, but sufficient time has not yet elapsed to receive answers from them.

The Farm and Garden Committee have also visited the contemplated site for the farm, which is a portion of the Government Domain at Parramatta, having a frontage to Toonengabee Creek and Parramatta River, and consisting of about 250 acres. The Council would earnestly recommend to their successors in office the necessity of establishing local committees in the various towns, for the furtherance of this grand object, which must appear to all of the utmost benefit to the whole colony.

During the year there have been three exhibitions held. One of camelias, on 22nd July, held in the hall of the School of Arts, the collection of that magnificent flower being far superior to any previously exhibited. On account of the day being very wet the attendance of visitors was limited, and the expenses much greater than the receipts. The spring exhibition was held in the Botanic Gardens, on Thursday and Friday, 1st and 2nd October, which proved very successful, and a great number of prizes awarded under the various heads of pot growing plants, cut flowers, fruits, vegetables, and agricultural and commercial articles. The receipts on account of this exhibition, being sufficient to cover the expenses and leave a balance to its credit—but by far the most successful exhibition was the autumnal,

held 25th and 26th February, when, in addition to the usual display of the produce of the vegetable kingdom, there were several collections of useful agricultural implements, competing for a silver cup, of the value of ten guineas, the gift of Thomas S. Mort, Esq.

The Society's Gold Vintage Medals were competed for by the principal wine growers of the colony. A marked improvement was observable in the general quality of the wine. And in the event of there being another grand exhibition in Paris, Australia will be found to have made good use of her time since she gained her laurels there in 1855.

The Council regret that, from their inability to complete the requisite arrangements, they have, as yet, been unable to hold an exhibition of stock, as provided for in the rules of the Society. They are, however, fully alive to the importance of the object, believing that from exhibitions of this kind, much good will arise to the colony, and trust the day is not far distant when the Society may hold its agricultural exhibitions beneath the sheds in connection with the farm buildings at Parramatta. During the past year twelve monthly meetings have been held, and well attended by the members, at which the following papers have been read:—

Mr. T. W. Shepherd: On native plants, and the pastoral, horticultural, and agricultural resources of Australia.

Mr. R. Meston: On the advantages of change of seeds.

Mr. J. E. Blake: On Australian wines (No. 2).

Mr. Theodore West: An analysis of the soil of the Hunter.

Mr. T. W. Shepherd: On native plants, and the pastoral, horticultural, and agricultural resources of Australia.

Mr. Theodore West: On a singular insect production found in some parts of Australia.

Mr. Robert Meston: On the deterioration and necessary renovation of colonial pastures.

Mr. F. Creswick: On Legorn grass.

Mr. R. Meston: On the effects of acrid and poisonous plants upon graminivorous animals.

Mr. Lewis Markham: On the necessity for a better system of cultivation.

Mr. Lewis Markham: On a reaping machine, invented by himself, accompanied by a working model.

Mr. Robert Meston: On agricultural associations and improvement societies.

Mr. W. Stewart: On a simple mode of raising water by cattle power, exemplified by a working model.

Mr. P. L. C. Shepherd: On naming or numbering plants.

Mr. Lewis Markham: On the potatoe, its culture, disease, and preventative.

Mr. P. L. C. Shepherd: On the cultivation of the Clianthus Dampierri.

Mr. Henry Waymouth: on bone manures and superphosphate of lime.

Mr. Lewis Markham: On the origin of vegetation.

Mr. Lewis Markham: On the pastoral pursuits of this colony.

Mr. Robert Meston: On the pastoral interest and general exhibition of live stock.

Mr. Lewis Markham: On Artesian wells.

Mr. Edwin Hickey: Observations on the cotton plant in Australia.

Mr. Robert Meston: On bones as a fertilizer of the ground.

In many instances, animated discussions have taken place on the reading of the above papers; the particulars of which have been placed before the public in the *Magazine of Science and Art*, which has been published monthly, and the twelve numbers bound up by the proprietor in a handy form for reference. The Council have entered into an arrangement for the continuation of the publication of the transactions of the Society for the current year through this medium, which they trust the members will encourage by their support.

The following donations of seed have been made to the Society during this year, viz.:—California prairie, or oat grass; Italian rye grass; and Zulu Kafir Imphee: from his Excellency the Governor-General. Nohl Kohl: from Mr. R. Garrett. Cotton, and a new Phæsolus; from Mr. Walter Hill, Moreton Bay. Horse-beans: from Mr. J. Gay. Sorghum Saccharatum, and a new Holcus: Sir D. Cooper. Most of which have been distributed to persons throughout this and the adjacent colonies; and, in the case of the prairie grass, reports of the most favourable nature have been received, and it is looked upon as a valuable addition to our imported pasture grasses.

The following donations of books, &c., have been made during the same period:—Leibig's Organic Chemistry, and Lindley's Elements of Botany: from Mr. F. Wilson. Sorgo and Imphee; Cotton is King; Plank Roads in the United States; the Plough, the Loom, and the Anvil: from the Hon. E. Wise. The Plough, the Loom, and the Anvil; three numbers of the Horticulturist, one American Farmers' Magazine: from Mr. T. Leavitt. Several numbers of the Gardeners' Chronicle: from Mr. W. M'Donnell: Drawings illustrating a paper read by Mr. T. West, on a singular insect production, from Mr. West. Specimens of various kinds of wheat, from Mr. G. A. Bell. A quantity of silkworm's eggs, from Mr. Knapp, junior.

Samples of cotton, the produce of Moreton Bay, from Mr. Walter Hill.

The Council offered a premium of life membership for the best essay on the cultivation of cotton, and for the best essay on the growth of the vine and manufacture of wine, to be sent in by the 1st June, 1858, for which premiums there have been no competitors. They would suggest to your future Council the desirability of again bringing this matter before the public. The Council have accepted a tender for the cutting a die for medals, on which will be an appropriate design. The die is to be completed within three months from this time, and will be formed in such a manner as will admit of its being attached to the presses at the branch of the Royal Mint, and will be able to strike the medals in gold, silver, or bronze.

The Council are still in receipt of communications of a friendly nature from the following societies:—

Society of Arts, Manufacture, and Commerce, London.

Agri-Horticultural Society, Kandy, Ceylon.

Philosophical Society of Victoria.

Society of Agriculture, Santiago, Chili.

The Council again have much pleasure in tendering their grateful thanks to the President for his active exertions in furthering the interests of the Society.

The Council are also under great obligations to the Honorary Secretary for his personal attention and assistance at all times, as well as for his kindness in placing his office at the disposal of the Society.

In retiring from their office the Council, in conclusion, beg to recommend that the most strenuous exertions be made to carry out the eminently useful objects which have been initiated during their term of office.

Much expense has been already incurred; a large expenditure must necessarily take place to effect even a portion of the operations of the coming year, and they hope that the new Council will continue the noble work as happily begun, looking to the anticipated great results as an ample reward for their exertions.

The number of members on the books are 580.

The following petition was also read :—

His Excellency Sir William T. Denison, K.C.B., Governor-General of all her Majesty's Australian Colonies, &c.

We, the undersigned, members of the Australian Horticultural and Agricultural Society, desire to bring under the consideration of the Government certain facts connected with the fulfilment of the objects for which the Society was constituted, and to pray for such aid and assistance towards the completion of an undertaking calculated to confer very great benefits upon the colony, as your Excellency, with the advice of your Executive Council, may think fit to bestow.

The Australian Horticultural and Agricultural Society, as now constituted, was formed in 1857, by the union of two societies having for their object the improvement of horticulture and agriculture.

The members of these societies, feeling convinced that the existence in a small community of two bodies professing to work out the same object by the same means was likely to create a rivalry injurious to the best interests of both, decided to combine together; and the present Society, which numbers nearly 600 members, is the result of their union.

Among the chief of the means which all the different societies have contemplated, as tending to the improvement and development of horticulture and agriculture, the institution of a model garden and farm has been pre-eminent.

Your petitioners have for some time past been busily employed in considering the place and the mode in which a farm of this kind could be best established, and arranging, so far as their power extended, the details of its management.

The alienation of the Government Domain at Parramatta having placed at the disposal of the Government a large tract of land of an average quality, your petitioners are of opinion that no better site could be selected for a farm intended to serve as a model for the whole colony, than one which lies at the junction of the two main lines of road from the north and the west—which, from its proximity to Sydney, would have the benefit of a ready market for its produce, and which would also be subject at all times to the easy inspection of the members of the Society, or of those interested in agriculture. An application was accordingly made to the Government for a grant of a portion of the Parramatta Domain, not exceeding 250 acres, for the establishment thereon of a model farm and garden.

The Government, while it entertained the application, and was willing to aid in carrying out the objects of the Society, did not consider itself justified in making a grant for the purpose in question, without being previously satisfied that the Society was in possession of funds sufficient to cultivate the land in such a manner as to entitle it to be called a model farm; and the application was referred back to the Society, in order that the necessary information should be afforded.

Your petitioners have since been able to prepare plans for the buildings, and to frame estimates of the cost which will have to be incurred:—

1st. In clearing and fencing the land.

2nd. In erecting the necessary farm buildings.

3rd. In providing machinery and implements of the most approved character.

4th. In the purchase of stock.

From this it appears that the total cost of entering upon the cultivation of a farm of 250 acres will amount to £10,901, or about £44 per acre, of which £7900 may be considered as the capital of the landlord, as being expended in fences and buildings—and £3000 the capital of the tenant entering upon the farm, with the intention of cultivating it in the best possible manner.

Your petitioners beg to state that they have every hope of being able, through the liberality of the members of the Society, and of those interested in agriculture, to raise an amount amply sufficient to enter upon the farm as tenants, and to pay as rent the interest of the money expended in fences and buildings, should the Government be willing to appropriate to this purpose an amount sufficient to defray the necessary outlay.

It was the intention of your petitioners to devote the amount derived from the cultivation of the farm, inclusive of the sum which might be considered as rent to the landlord, to the formation of a fund, from which prizes might be given for the introduction of the most approved kinds of machinery—of plants and seeds—the produce of which might be beneficial to the community commercially—of all descriptions of stock calculated to improve the existing breeds. And your petitioners cannot but think that objects such as these are worthy of the support of the Legislature; and that the amount derived from the rent of the model farm might be with advantage granted annually to the Society as a prize fund.

Your petitioners would therefore pray that a sum, not exceeding £7900, be placed upon the estimates, for fencing the model farm and for erecting the buildings thereupon, as shown in the accompanying plans; your petitioners undertaking to pay to the Government the interest of the amount actually expended. And your petitioners would further pray that a sum equal in amount to the interest so paid, which may be considered as the rent of the farm, may be placed upon the estimates annually, as a fund out of

which prizes for the encouragement of horticulture and agriculture may be paid.

Your petitioners would beg to observe that, by acceding to their prayer, the Government would not only be giving the most effectual aid to the most important interests of the colony, but would do so in a manner which would not afford an opening to any abuse. By admitting your petitioners as tenants, the Government would have a guarantee that the capital advanced would be at all times recoverable, should the Society fail in carrying out its objects; and by making the grant in aid of the Prize Fund annual, a perfect check would exist upon the administration of such a fund.

Your petitioners trust, therefore, that your Excelleney will favourably entertain their prayer.

And your petitioners, as in duty bound, will ever pray.

Mr. Richard Keyes moved, and Mr. J. H. Williams seconded, the adoption of the report, and that it be printed and circulated among the members, which, on being put to the meeting from the chair, was carried by acclamation.

Proposed by Dr. Bland, seconded by Mr. J. Graham, that the thanks of the Society be accorded to the President, Vice Presidents, Honorary Secretary, Treasurer, and Council, for the satisfactory manner in which they have conducted its business.

Carried unanimously. The President returned thanks on behalf of himself and the other office-bearers of the Society.

Proposed by Mr. W. G. Pennington, M.L.C., seconded by Dr. Mitchell, M.L.C., that Messrs. J. W. Waugh and T. R. Leavitt, be appointed auditors for the ensuing year. Carried unanimously.

It was resolved, on the motion of Mr. T. W. Shepherd, seconded by Mr. G. A. Bell,

That the meeting now proceed to ballot for the Council for the ensuing year, and that Dr. Houston and Mr. Moutrey, in conjunction with the secretaries, take charge of the ballot box, and act as scrutineers.

Proposed by Mr. J. E. Graham, seconded by Dr. Bland,

That the Council be instructed to communicate with the Council of the Cumberland Agricultural Society, for the purpose of ascertaining how the two Societies may best be amalgamated. The result of such conference to be submitted to a special general meeting of the Society, to be called together for that purpose.

Carried.

The Honorable E. Deas Thomson presented the Society with some seed of the Imphee, for distribution among the members, together with an American work, entitled Sorgho and Imphee.

To the Editor of the Sydney Magazine of Science and Art.

Pine Lodge, Berrima,
April, 1858.

Sir—Having observed in the *Sydney Magazine of Science and Art*, an article on the subject of the Culture and Disease of the Potatoe, and being aware of the value and importance of that root, I have pleasure in laying before your Society the result of a few experiments which have occurred upon my own establishment, and under my own personal observation.

When I first came up to this farm, I employed a man to break up a piece of land for a garden, and sent to the South Creek—formerly my late father's residence—for some seeds; amongst other things I received a bag of what I considered useless little withered potatoes, very few of them up to the size of a domestic hen's eggs, and most of them under that of a gooseberry.

However, as the ground was prepared, I had them put in, but as I did not expect one fourth of them would grow, I had them put four times as thick in the drills as I should have done if the seed had been such as I considered good; to my surprise, they all came up, and were allowed to stand; they were as well earthed up as the space would permit, and when at maturity the number was so great as to force the earth up on each side of the drills, and many of the potatoes above the surface. The quality was good but small, except one root at each end of the drills, while they were very large, from their having plenty of earth and room to grow. I was led from this circumstance to believe that small potatoes were as good for seed as large ones, and being anxious to make the most of my small crop of little potatoes, I had, on the following season, two and a half acres of new land prepared, first ploughed with bullocks, and cross ploughed and harrowed down with horses. In preparing the seed, any one of the size of a walnut I had cut, under that set whole. One man opened the drills and covered the sets with the plough, two women and one man dropped the sets; in two days the two and a half acres were completed; they were subsequently earthed up with the plough. The produce was exceedingly fine both as to size and quality. The average produce was one cwt. per rod.

Upon a subsequent occasion I went into a shed where my overseer and two men were cutting potatoes for planting, had I not done so all my little favourite sets were doomed to the muck-hill. I told them of my former experiments, at which they laughed, stating that strong sets must produce a strong plant and a heavy crop. Feeling confident that I was right, and desirous of having another proof of it, I desired that all the very small sets may be planted by themselves, which was done; on the crop being dug, the same men admitted that the three rows from the small sets were equal, if not superior, to any others in the field,

Another season I was late in getting ground ready for potatoes, and decided upon putting them in after the plough upon new land, that is by dropping the sets in every third furrow; unfortunately the land was ploughed across a slope instead of up and down, consequently many of the sets perished from rain, soon after planting,

on the whole I had a better half crop of large potatoes than I have ever grown under any other treatment. My farm consists of chocolate coloured whinstone, land admirably adapted to the growth of the potatoe; indeed, any English crop, grain, fruit, or vegetable, and no doubt would be cultivated most extensively in this district, if we had but a railway to convey our produce to market.

I take the opportunity of sending you a sample of oats grown upon this farm, for which I was awarded the silver medal at the Goulburn Agricultural Show; if you consider them worthy of a place in your exhibition, I shall feel obliged,

And remain, dear Sir,

Yours faithfully,

HENRY BADGERY.

W. DEAN, Esq., Honorary Secretary to the Horticultural and Agricultural Society, Sydney.

To the Editor of the Sydney Magazine of Science and Art.

Osterly, 2nd July, 1858.

SIR—I beg to hand you herewith a plan and sketch of a Stumping Machine, which I caused to be designed by Mr. William McGregor, an engineer now on my establishment, for the purpose of removing the stumps from our arable lands, in which work it has proved itself most effective; and as I have never seen anything of the kind used in this country, it has occurred to me as being a very proper thing to lay before the Agricultural Association.

The machine is worked by two or three men, according to the size of the stumps to be taken out, and the power of this one is such, that I have seen three men break a chain of 7-8th iron, against a sound stump of three feet diameter. Where the stumps do not exceed one foot, or one and a half in diameter, two men may remove from 50 to 70 in a day, or even more if they are very thickly spread about, and the soil not very stiff. After rain they are easily taken out, all the roots coming with them.

I consider this machine to be of such importance in the saving of labour, that no one who has lands to clear should be without one. I shall be happy to lend the moulds for the castings to the Association, or to any member of it.

The castings were done by Messrs. Halliday and Co., and the wood and iron work on my own establishment.

The weight of the castings is 6½ cwt. The other part, without the chain, 5½ cwt. Together, 11 cwt. The whole cost of the machine, with chain and everything complete, may be put down at £25. It can be moved from one place to another by a single horse or a couple of bullocks. See sketch in present number.

I have the honour to be, Sir,

Your most obedient Servant,

EDWIN HICKEY.

ON THE APHIS INSECT AFECTING THE CABBAGE TRIBE.

By F. CRESWICK.

DURING the last 18 months a disease or blight has made its appearance in the cabbage, and, indeed, all plants of the *Brassica* tribe as well, such as cauliflower, turnip, radish, &c., and the injury done by it in the whole of the Australian colonies has been so extensive as to cause a fear amongst the colonists that the cultivation of this very essential, and almost necessary tribe of culinary vegetables, would be no longer practicable. According to accounts from the other colonies, coupled with our experience in this, its ravages have been sufficiently extensive to warrant something like such a conclusion. It is a fact worthy of the enquiry of the entomologist how this destructive insect should have made a simultaneous appearance throughout every portion of the colonies of New South Wales, Victoria, Tasmania, and South Australia—vast as their extent and various as their climates and other peculiarities are. Whether the phenomenon is caused by some unusual or inconstant atmospherical influences, or by the introduction of the ovæ amongst introduced seeds of the tribe to which it chiefly confines its depredations, and also whether the insect is a native hitherto confining its empire to those members of the cabbage race indigenous to Australia (of which there are several), and only recently having found out our richer cultivated patches of exotic origin. Not being acquainted with entomological science I shall not presume to give an opinion.

The serious consequences of even the partial loss of the crops spoken of have very naturally led to many proposals of specifics for the cure of the blights, such as dusting with sulphur, lime, sand, snuff, and sprinkling with decoctions of tobacco water, elder leaves, laurel leaves, and solutions of ammonia, alcohol, and others, none of which have been found practicable to any useful extent. It is now my intention to propose a remedy which will be cheap in its application, and I think will be found more efficacious than any hitherto made known to the public, although I am of opinion that no artificial remedy will ever be found perfect, and that the scourge will disappear as suddenly as it made its appearance, through the effect of natural circumstances. The latter conclusion I have arrived at by the recorded experience of the sudden appearance and as sudden disappearance of closely allied blights in the mother country, such, for instance, as the hop aphis, which, for two successive seasons almost totally destroyed the hop crops throughout England, and has not since made its appearance to any great extent.

Before explaining my proposed remedy, or, at least, palliative, I think it would not be uninteresting to the members to put before them some particulars respecting the nature of the blight which forms the subject of this paper.

The aphis is known in some of its varieties to every horticulturist, as infesting many plants which come under his management; the most common being known as the green fly, plant louse, American blight, &c., &c. The cabbage blight, to which these remarks more particularly refer, belongs, as before said, to a genus of insects known to naturalists as aphides, and the species as Aphis Brassicæ, in reference to its preference to the natural order Brassicæ. The genus consists, perhaps, of more species

than that of any other in the multitudinous family of insects. It has been estimated that there exists somewhere about 1500 species of it, but as yet not more than from 80 to 100 have been satisfactorily described. The following remarks are extracted from a stray number of the Entomological Magazine, twenty-two years old:—"The true blight, or aphis, is a quiet, dull, stupid looking insect, mostly without wings, but sometimes it has four, two of which are much larger and longer than the other two, and fold over and hide them, reaching beyond the body, and meet together behind it; these wings are generally as clear as crystal, with a few veins in them, yet if you hold the insect in the sunshine and examine him through a glass you will find they will take all the colours of the rainbow. You will also find he has a long trunk or sucker, which is used as a pump or siphon, through which the sap of the plants is drawn. I have sometimes seen this sucker so long as to pass under the breast and legs and reach a considerable distance behind the body, but it is not generally so. All blights infest the young and juicy shoots and leaves of plants, for the purpose of sap sucking, and the plants so honoured by their operations forthwith play the most amusing and incredible vagaries, bearing blossoms instead of leaves, leaves instead of blossoms, twisting into corkscrew stems which ought to be straight, and making straight as sticks those which, like the scarlet runner and hop, ought to twine; in the peach making the leaves hump up in the middle, and making the tree to look as though it had a famous crop of young fruit; making apple trees bear blossoms on their roots, and causing roots to grow out of their young shoots, and by tormenting orchards in this way preventing the fruit from ripening, and make it woolly, tasteless, and without juice. Our China asters often owe a good deal of their beauty to these vermin; they act as a spur to make them blossom beyond their strength and nature, and then die off without bearing seed. It is amusing to see with what regularity the blight station themselves on the young shoots of the guelder rose, crowding so close together that not a particle of the rind is to be seen, and not unfrequently forming a double tier or two thicknesses, the poor sprig losing its former unbending upright position, and writhing itself into strange contortions. Blights are of all colours, but green is their most fashionable hue; those of broad beans are black as soot, and velvetty, but these, if attended to, do but little harm; they cluster at the very top, and each bean should be lopped just below the blight, and the top carried away and burnt, not thrown on the ground, or else they are sure to climb up the bean stalk again, and, stopping here and there on the best landing-place to increase and multiply, thus soon covering the whole plant. Nor should they be buried in the ground, for they take care to outwit you by living under ground for months, and when the gardener's spade turns them up again they make for the beans directly. The plan of lopping the beans does not injure the crop, but rather improves it. The blight of the willow is very large, and at first sight looks greyish, but under a glass is beautifully variegated with black and white; when crushed it gives out a deep blood coloured dye, which stays on your hands several days in spite of several washings."

I have taken a good deal of pains to find out the birth and parentage of true blights, and for this purpose have watched, day after day, the colonies of them in my garden, and single ones which I have kept in doors, and under tumblers which I have kept turned upside down. The increase is prodigious, it beats everything of the kind I have ever seen, heard, or read of. Insects in general come from an egg, then turn to a caterpillar which does nothing but eat, then to a chrysalis which does nothing but sleep, then to a perfect beetle or fly which does nothing but increase its kind. But blights proceed altogether on another system. The young ones are born exactly like the old ones but less; they stick their beaks through the rind, and begin drawing sap when only a day old, and go on quietly sucking away for seven or eight days; and then, without either love, courtship, or matrimony, each individual begins bringing forth young ones, and continues to do so for months, at the rate of a dozen to fourteen every day, and yet continues to increase in size all the while. There seems to be no males, no drones, all bring forth alike. Early in the year these blights are scattered along the stems, but as soon as the little ones come to light and commence sap sucking close to their mother the spaces get filled up. The old ones look like giants among the rest, as here and there an ox in a flock of sheep, when all the spare room is filled up and the stalk is completely covered.

The young ones, when they make their first appearance in the world, seem rather posed as to what to be at, and stand quietly on the backs of the other, for an hour or so; then, as if made up their minds, they toddle upwards, walking on the backs of the whole flock till they arrive at the upper end, and then settle themselves quietly down as close as possible to the outermost of their friends, and then commence sap sucking like the rest. The flock by this means extends in length every day, and at last the growing shoot is overtaken by the multitude and completely covered to the very tip. Towards autumn, however, the blights undergo a change in their natures, their feet stick close to the rind, their skin opens along their back, and a winged blight comes out. (The summer generations are entirely wingless.) These are male and female and fly about and enjoy themselves; and, what seems scarcely credible, these winged females lay eggs, having first lived through the winter, and whilst this operation is going on a solitary winged blight may be observed on the under side of the leaves or on the young shoots, particularly on the hop, and different from all its own progeny in being winged and nearly black, whereas its young are green and without wings. In May, the fly lays a lot of eggs, these eggs hatch and become blights, these blights are viviparous, and that without the usual union of sexes, and so are their children and grandchildren, the number of births depending entirely on the quantity and quality of their food; and at last, as winter approaches, the whole generation or series of generations assume wings which the parents did not possess, undergo frequently a change of colour, and in the spring, instead of being viviparous, lay eggs."

APHIS BRASSICÆ.

After trying various remedies, without any real good effect, it struck me if I could stop their progress in migration, or to stop in any way their respiratory organs, it would be beneficial, and having a small quantity of gum by me, I dissolved it in hot water and applied it to some very much infested cabbage plants by sprinkling them with a clean paint brush while the solution was warm, and, to my satisfaction, I found it adhere to them, and as the day became warm the gum water dried, and the insects were entirely encased. I believe every one, little or big, being so encased perished. I afterwards applied it on a larger scale, and applied a solution of gum water and tobacco water mixed, from a fine-nosed watering pot, and found my plants decidedly cleaner after this application. I think the gum water should be applied early on a fine morning, so that the warmth of the sun may dry it, and it is my opinion that the dew of the succeeding night will be of great service in, as it were, giving another dressing, by moistening the dried coat of gum, which will stop the progress of the aphis, it being their manner of progress to walk over the backs of each other until they pass over the foremost, and then immediately insert their sap sucking snout; and here, I believe, the greater part of their number become stationary. I would suggest that I think size or glue would be found cheaper and perhaps more efficacious than gum, but have not had an opportunity of testing it.

Here I would wish to mention that, on one occasion I planted a quantity of cauliflower plants quite clean from the blight, but in about a fortnight after I found them swarming with the aphis, so much so that I determined to pull up the whole, but on nearing a large heap of stable manure, which had been made a day or two previous to the cauliflowers being planted, I found a marked decrease of the insects, which made me to ask what could be the cause, as it could not possibly be from the drainage of the dung as no rain had fallen, and it was not so wet when put together as to allow any superfluous moisture to drain from it. Now it struck me that, as the fumes caused by fermentation contain ammonia it, in all probability, was the cause, and this was plainly to be observed to the fourth or sixth plant from the heap, which, allowing only two feet to each plant, would be from eight to twelve feet. I also observed that the insects were thinner to a greater distance, indeed the cauliflowers near the manure were the only ones I cut out of 450 planted. If chemists were to turn their attention to this subject, I think some ammoniacal preparations may be made which would be found useful.

PROCEEDINGS OF THE PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

The Nineteenth Monthly Meeting of the Philosophical Society of New South Wales was held in the Hall of the Australian Library on Wednesday evening, July 14th, His Excellency Sir W. T. Denison in the Chair.

The following gentlemen were duly elected ordinary members, viz :—

The Honorable Joseph Docker, Esq., M.L.C. ; and Mr. Thomas H. Bradridge.

One new candidate was proposed and seconded.

NOTICE OF MOTION.

Mr. Joseph Dyer gave notice that he should move, at the next monthly meeting :—"That a sum not exceeding one hundred pounds (£100) be appropriated from the funds of the Society, as a reward for the best essay on the mode to be adopted for forming the streets of Sydney ; the essay to be accompanied by plans and estimates of expense—approved by a Board of professional gentlemen appointed for the purpose."

The President informed the meeting that, in consequence of certain improvements being about to be made in the Hall of the Australian Library, the meetings of the Society will be held in some place to be afterwards determined on and advertised, until the alterations in the Hall are completed.

Mr. Alfred Roberts then read the second part of a Paper on the Poison Apparatus of Venomous Snakes, with a Description of some of the species found in this colony, illustrated by numerous specimens, both living and preserved, and by drawings.

The Rev. W. Scott's Paper on the Meteorological Observations of New South Wales, was postponed until the next meeting.

Mr. F. W. Rayner, of H.M.S. Herald, exhibited alive, in cages, the following marsupial animals, obtained during the recent cruise of the Herald on the Western Coast of Australia, viz. :—

Phalangista sp. ? from King George's Sound; Bettongia sp. ? from Shark Bay, with a young one in her pouch; and Peramele sp. ? from the same bay; and gave to the meeting some particulars of their history.

The meeting then adjourned until Wednesday, the 11th of August.

PART SECOND.

ON THE STRUCTURE AND FUNCTION OF THE POISON APPARATUS IN VENOMOUS SERPENTS, WITH A DESCRIPTION OF SOME OF THE SPECIES FOUND IN AUSTRALIA.

I propose this evening, to consider, first, the

description of such parts of the Venom Apparatus as were omitted in my paper, read before this meeting in October last.

Secondly, the conclusion which this investigation has suggested to my mind, in reference to the Classification of Serpents. And,

Finally, I shall describe some specimens of certain kinds of serpents found in this country.

Reflecting upon the evidence afforded by the dissections made by me last summer, I could but feel, that if, as appeared evident, the fangs always possessed a more or less vertical position, whether in a state of repose or otherwise, the structures of the lower jaw must necessarily be in constant danger of receiving injury. And this would be more especially the case in those species in which the fang was the most developed, because in such the vertical position was shown to be, in the highest degree, permanent. The certainty of injury to the tissues beneath the fang, when brought into frequent contact with it, was, indeed, so apparent, as to suggest to my mind the form of protective arrangement which would probably be found, and the first specimen examined proved the truth of this deduction. In it (a full-grown death adder) I found a deep and capacious fossa, on either side of the lower jaw, in that portion immediately opposed to the fangs, and external to the maxillary ramus. These fossæ are loose and capacious in their formation, being covered with lax skin and mucous membrane only; they contain a thick and glairy mucous which entirely fills the cavity. The extent of my former observations on the structure of the venom gland did not enable me to take more than a cursory view of its structure. Its consideration in detail will, therefore, now occupy our attention. (Fig. 1—*a a.*)

Figures 3 and 4 represent poison glands in section, and figure 2 shows a similar view of an ordinary vascular or erectile growth. I would especially invite a notice of the striking similarity which exists between the general appearance of these structures, which I accept as corroborative evidence of the high vascularity of the gland, and as important in its bearing upon the probable character and extent of its spontaneous secreting power.

In my former notice of the venom gland I used the term tubule, to describe the originating portion of the duct, but further dissection and microscopical examination has led me to adopt, in its place, the word "sacule," as better calculated to afford a correct impression of its true character.

Tracing the main duct of a so-called poison gland backwards into its structure, it is found to divide and subdivide soon after its entrance, and is then quickly lost in the general saculated structure of the part. Its radicals open into sacs, the walls of which are folded into sacules, forming, thus, an instance of Nature's most simple mode of affording an extensive secreting surface within a limited space. (Fig. 5—*aaaaaaa.*)

As before stated, the walls of the sacs and sacules are lined with columnal epithelium, (fig. 8.) the basic ends of the cells of which occupy the inner (excreting) surface of the sacule or sac cavity, while the apical are connected with the basement membrane, approximating to the capillary blood vessels which ramify in the gland.

These columnal cells (figs. 6 and 4.) do not appear to differ in any material degree from those found in other structures. All the specimens I have examined contain one, and occasionally two, well-defined nuclei in various stages of developement, while the amount of granular matter in the cell cavity has been unusually large.

In common with those lining the ducts of other glands which discharge their secretion into a portion of the alimentary canal, they are probably ciliated, as, although up to the present time, I have been unable to see the ciliæ, I have distinctly witnessed an active current in portions of fresh gland (taken from a recently killed snake), under the microscope.

The secreting power undoubtedly exists in the epithelial lining, and would seem to be brought about by endesmodic action, modified by vital influence, and aided by the character and degree of the vascular supply.

Thus we may suppose, that from the plasma of the blood thrown out in contact with the basement membrane of the sacules, the components of the so-called poison are attracted, possibly through the influence of the nucleus; into the cavity of the cells, from whence they exude as perfected secretion (venom) into the sacule cavity.

The wonderful influence of local nerves upon the function of a given tissue is here beautifully exemplified. At one spot we find a membrane secreting venom, one-fourth of a minim of which will prove fatal to human life, and half an inch distant, a similar structure, extracting from the same circulating fluid, but under a different nervous influence; an innocent lubricating mucous.

Pure venom consists of a colourless, transparent fluid, thin and limpid, while contained within the gland or its duct, but becoming viscid and within a few minutes solid, when exposed to the atmosphere. Thus solidified, it will keep for an indefinite period, and, as far as I can ascertain, without decomposition, or loss of its life-destroying power.

This alteration in the physical character of the secretion is accompanied by contraction, (fig. 10.) but not by much evaporation of watery constituents. Of the exact nature of this change I am unable to speak with certainty. It possesses two of the qualities which characterize coagulation, viz., solidification and contraction, but, on the other hand, it remains transparent and structureless. That it is not purely chemical is proved by the fact that the peculiar general arrangement of its elements remain the same, or appear to be capable of producing the same fatal effects, accompanied by similar symptoms when absorbed into the circulation. On the other hand, we may inquire whether the effect produced upon the living organism by its absorption is chemical or vital in its character, and the answer must, I imagine, be to the effect that it can only be looked upon as, to a certain extent, a chemical and inorganic agent when used long after its removal from the organ of its secretion and separated from the vital influences of its production and preservation as an animal fluid.

Examined microscopically, the venom appears to consist of a transparent fluid, having a very pale cream-coloured tinge; it is seen to contain a limited number of granular bodies, similar to those found within the cells which line the

sacules, and resembling in appearance the mucous corpuscle—these may, in all probability, be considered as independent of the poisonous qualities of the fluid, and as mainly connected with the process of decay and renewal in the gland tissue.

I have made several endeavours to trace the gland duct into the fang canal, and more especially to elucidate the manner in which its connection with a fractured or useless fang is obliterated and made good with the hitherto supplemental fang, as it gradually becomes fixed in its socket and serviceable.

The actual channel, however, in the duct is so small that there is great difficulty in injecting it. I have been successful in two instances, in both of which the coloured gelatine passed freely through the fang, without intermediate escape. In each case considerable pressure was kept upon the piston of the injecting syringe for some few minutes, but in neither was a trace of it to be discovered in the base of the supplemental fang.

The entrance of the duct into the basic opening of the fang is protected from injury and pressure by an overlapping of the nasal cartilage.

Judging from the quantity of injection which escaped at the apical apertures of the fang in these experiments, I should suppose that the amount of venom which could escape during a vindictive bite would not exceed the fourth part of a minim.

It is difficult to surmise what reason should be most justly attributed to nature for providing venomous serpents with an agent possessing the power of retaining its fatal qualities for long and indefinite periods after its removal from circumstances in which only it can fulfil its special functions—yet so it is. For the present we can only consider it as withheld from our powers of conception for a time, but which, from its unusual occurrence and its deviation from the ordinary principles of physiological action, invites further investigation. For my own part I cannot conceive but that an agent so powerful in action and easily preserved, is destined by the Divine will for some purpose conducive to the welfare of mankind, which will be made known to us when our persevering enquiries have reached the extent to which this and other similar wonders invite us.

Deeply interesting as this subject is, I should trespass far beyond the object and limits of this paper, were I to extend my observations far into an examination of the physiological action of venom upon the vital powers of the prey.

It will, however, be necessary to take a passing glance at this portion of the enquiry, and I shall subsequently direct your attention especially to its probable, and, as it appears to me, primary influence as a digestive agent.

In order to obtain a general and uniform impression of its power as a devitalising fluid, let us briefly consider the effects of that secreted by the rattlesnake, a vindictive bite from which will destroy human life within thirty minutes.

We may suppose that one drop of the venom is injected into the wounds, and calculate the quantity of blood contained in the vessels of a man body at 28lbs., or 215,000 minims.

r this, experiment has proved, will circulate through the heart in some period varying between one and four minutes, or about twenty times in one hour.

In this instance we have a poison diluted with 215,000 times its quantity of a vital circulating fluid, and passing through the heart, brain, or other organ, about ten times before death occurs; or, to take another view—

The entire blood, spontaneously modified in its character by the contact of a minute portion of its bulk with this peculiar and powerful agent, causes death, after circulating through the system during thirty minutes.

The question, then, appears to resolve itself into the following heads:—

First—Does the venom circulate as such, simply mingled with the blood, as a conducting medium by which it is conveyed through the system?

Secondly—Is it the excitant of a new and spontaneous morbid change in the character of the blood itself? Or,

Thirdly—Does the blood, by contact with it, or simple admixture, merely lose its vital power?

Many attempts have been made to solve these questions, and some writers, men of experience and reputation, have not hesitated to express an opinion to the effect that the change consists in the production of an alteration of the blood similar to fermentation. This, however, is improbable, and it seems to me, better at once to confess that at present we are not possessed of sufficient data upon which to found a judgment.

At the same time, it appears desirable that we should diligently collect together such facts as seem likely to assist in solving the difficulty, and of these I will now mention such as have fallen under my own observation, to which I shall add such as bear upon the probable possession of a digestive quality by the fluid called venom.

Within the last few months I have kept a brown-ringed snake, a black snake, a diamond snake, a death adder, and a small ringed venomous snake, in one case, for some considerable time. They lived, as far as I could judge, contentedly together, except that the small ringed snake evinced timidity, and, when excited, the brown-ringed snake bounced, if I may be allowed the term, without attempting to bite, the very much larger diamond snake.

Two rather more than half-grown rats were put into the case when occupied by the brown-ringed and diamond snakes; the former soon seized one of the rats, which died in about two minutes, after a few but severe tetanic muscular spasms. The snake then dragged it from the corner in which it had expired, but in doing so was disturbed by the second rat, which it immediately seized, *holding on firmly* for some seconds. The animal did not at first seem injured, but was soon seized with symptoms similar to those of its companion, and died in five minutes. The snake then commenced to engorge the first rat, and after great exertion took it in as far as, and almost including, the shoulders, but disgorged it again during the night. Upon dissection, the side of the head, neck, and shoulder, appeared to have been freely punctured, and considerable echimosis and other signs of severe injury were found to exist. During the process of attempted

engorgement, which I carefully observed, the upper jaw was thrust forwards in a direct line with the body, but the lower acted more like soft and highly elastic tissue, and accommodated itsel as such to the substance. The sides of the upper jaw were pushed forwards alternately, the one being retained in situ by the fang acting as a pivot, upon which the head rotated. It was evident that the fangs pierced the prey each time the jaw was nipped.

A brown ringed snake, which had freely displayed the nature of its venom apparatus, by quickly destroying rats and mice, held on to the hind leg of a frog for some minutes, with the fangs visibly well inserted; the wounds bled freely when the frog was released. It was alive and brisk the following, day when it received its freedom.

Every other animal bitten by these snakes has quickly died.

A rat was put into the cage with a couple of diamond snakes, and one of them, irritated by the movements of the rat, seized and killed, but did not eat it.

I removed a full-sized venom gland from a recently killed death adder, which I calculated might contain about three minims of poison, and placed it in the centre of a small piece of meat, this I gave to a cat, who masticated and ate it; she suffered no inconvenience.

The same cat stole the head of a recently-killed death adder, glands included, and I have every reason to believe she ate it; she prowled about to get again at the serpent's body, and appeared not to suffer in the slightest degree.

Some ivory points were charged with fresh venom from a death adder; a little afterwards one of them was inserted under the skin of the leg of a kitten, which died within an hour, apparently in pain. This experiment was repeated in two, and again in four months, with the same result.

I have always observed, that when a venomous snake attacks *prey* with the intention of destroying, it seizes and holds on to it as long as possible; in attempting to accomplish this it is often much thrown about by the struggles of the prey, under these circumstances it is generally easy to see that the fangs are pressed into the wound.

The blow of a diamond snake, on the contrary, is instantaneous. In the pelagic serpents (all of which, as far as I have examined, possess fangs) the fangs are remarkably small, but this is fully compensated by the greater comparative developement and deep grooving of the inferior maxillary teeth.

None of the venomous snakes in my possession have killed animals put into their cage which they have not either afterwards eaten or tried to swallow, or which have disturbed an anticipated meal, as in the case of the small rat and the brown-ringed snake.

Having concluded a description of the so-called venom apparatus, as derived from an examination of snakes of this country, it is necessary to enquire whether the objection made to the present system of classification, in my first paper, has been justified; and if so, whether our investigation offers any suggestions for its modification.

The points to which I called attention in the classification of Dumeril and Bibron, as open to criticism, were the following—

1st. The mode in which the order ophidia is rendered into the sub-orders *innocua* and *venenosa*.

2nd. The incorrect general impression afforded by the use of terms such as the above, when applied as typical names.

In reference to the first it was proved and argued that all toothed serpents possess secreting glands in connection with the mouth, the fluid discharged by which has, in some varieties, a simple digestive action, and in others more or less of an additional life-destroying power; further, that the characteristic function of this secretion is indicated by the individual dental apparatus; while, finally, the transition from the one extreme to the other, was held to be gradual. For confirmation of the above, I have only at the present time to refer again to the experiments before mentioned, which appear to me to afford considerable corrobative evidence on this portion of the subject, and to indicate further that the introduction of the secretion transmitted by the fangs into the structure of prey is as effectually and fully accomplished by them as that of the saliva is, by the teeth of other snakes, if, indeed, it is not more so.

In regard to the second, it is presumed that sufficient evidence has been brought forward to prove, first, that the fangs as well as teeth are freely used to pierce the food in the process of engorgement. Secondly, that the fangs are weapons whose principal destructive power is exerted in killing prey, or, in other words, that they are the means provided by nature for obtaining food; and, finally, that the last and *tertiary* use of this dental modification, with its attendant secretion, is that of a weapon of defence.

I find, upon reference to works, that no less than sixteen different modes of classification already exist, a fact which is ample in itself, without remark, to prove the difficulties with which this subject is surrounded. Yet it must also be observed, that having these upon which to found his arrangement, and possessing the most untiring energy of enquiry to labour with, Dr. Gray has, in his synoptical catalogue of the snakes in the British Museum, produced an arrangement which, though perfect in itself, is, to the student in natural history, difficult to understand, and the specimens in which (I speak with deference) are not always placed in their correct position. An example of this exists in the position of the death adder of this country, which is found among the *viperidæ*, and ought, accordingly, to possess no posterior superior maxillary teeth. In reply to this, it may, probably, be brought forward that these teeth are difficult to detect and have been overlooked, but if so, I would submit that the developement of these has not, in his classification, received the attention which I conceive it deserves.

To return to the consideration of the subject, it appears impossible to define accurately the line of demarcation between a truly venomous and an equally innocent snake. Secondly, that the terms innocent and venomous, when used as typical of an order, and in accordance with their true meaning, are often misunderstood. And, finally, that these terms fail to express the

possession of one of the most important of the functional qualities of the secretion called venom.

With these facts before, me and having, moreover, experienced the greatest difficulty in finding the correct position of the specimens which I have examined, I feel I may venture to suggest that a simple primary classification might be founded upon the following data:—

First, That all serpents are provided with different modes of catching and destroying prey, and introducing the salivary secretion (inclusive of that called venom) into its tissues, which properties are faithfully indicated by the character of the dental apparatus, and of the dorsal muscular developement, respectively. And,

Secondly, That the transition between these, and the degree to which, in some varieties, they each assist the other, is gradual and varied.

Although, moreover, venom can be used with fatal effect upon man and other animals too large for prey, I should hesitate to allow, that such is more than an interesting fact, or of sufficient importance to be made the type of a sub-order.

It was my original intention simply to state the principle upon which I felt some modification might be made in the present mode of arrangement, but I have found it necessary to sketch out the accompanying table, to render my views more clear, and give them a form. I cannot, however, offer this to your notice without at the same time expressing a wish that it should be considered only in the light of an example of the mode in which the principle may be carried out, and not as an attempt at the form of arrangement which is to be ultimately adopted.

ORDER—OPHIDIA.

Sub-Order.—1.

Dental appendages of superior maxillary bone, more or less channelled.

FAMILY A.

Entire dental development centred in anterior fangs.

FAMILY B.

Fangs, anterior, and smooth teeth, posterior.

1. Bi-dental; not more than two posterior teeth.
2. Quarta-dental; not more than four posterior teeth.
3. Sexa-dental; not more than six posterior teeth.
4. Octo-dental; not more than eight posterior teeth.
5. Multi-dental, more than eight posterior teeth.

FAMILY C.

Posterior teeth more or less developed into fangs.

1. Anterior teeth, more or less grooved.
2. Anterior teeth, smooth.

Sub-Order.—2.

Four rows of simple teeth in superior arch of mouth, and two in lower.

Sub-Order.—3.

No teeth developed in upper or lower arch of mouth.

This subject requires much additional observation and the performance of some further experiments before it can be satisfactorily set at rest, and I would particularly invite attention to the relative development of the fangs and dorsal muscles in the same specimen, with the general proportions of the body, as indicative of the mode of catching and destroying prey.

I have experienced so much difficulty in my attempts to classify the snakes of this country, according to the arrrangements now in use; and, on the other hand, I am so fully impressed with the desire that other observers should corroborate my views by their dissections and observations, that I have thought it better not to classify the serpents of this country which I am about to describe, preferring to place the particulars in a tabular form, arranged so that they can be subsequently placed in their respective families, genera, &c., according to whatever special mode of arrangement may be adopted.

The accompanying descriptive table has been arranged with this view, though, perhaps, with somewhat of bias towards the developement of the above principle.

It may, doubtless, be urged against it that the most important features of a specimen have not received their proper position of preference, but as this is a point upon which observers entertain different opinions, and as, moreover, I only submit it to your notice for the use of collectors and others in Australasia, I have considered it better not to attempt more than a reasonable systemic arrangement, while I have, at the same time, endeavoured to give it a form, which, by rendering the examination to a certain extent easy and connective, would make it capable of fulfilling a deficiency which, I believe, exists in the absence of any such table for a simple and natural mode of examination.

In a few words I have endeavoured to arrange one, by means of which any person residing in the country districts will be enabled to place on record a useful description of such specimens as may fall in his path.

There cannot be the slightest doubt but that the reptiles of Australia are as varied and numerous as they are interesting, and we have ample proof that many varieties have yet to be described; while it must, at the same time, be admitted that many valuable specimens are lost to science because gentlemen have not confidence in their powers of description, or because they render them in so many various forms that it is impossible to reduce them to any system of classification.

In reference to the following descriptions, I may state that they have been undertaken under the full impression that some of the specimens have been more ably reported by other observers, though, also, in the hope that a systematic account of all the varieties known in this hemisphere, as far as they can be obtained, would, if collected together, prove of some value to the information already before the public. It is so difficult, however, to obtain uninjured specimens that I am able only to offer tables of a few varieties on the present occasion.

Of these I may observe that the descriptions are those of specimens and not of an average of specimens; that I have preferred, in making my notes, to mention the size of the specimen and the size which it is known to attain, rather than to hazard a guess at its age.

All the land snakes of this colony are described from fresh specimens, the water snakes from

specimens in spirits, with which I have been kindly favoured by W. Macleay, Esq., Dr. Rayner, J. D. Macdonald, Esq., and the Rev. W. W. Campbell.

That some kind of investigation such as the present, was desirable, is proved by the single fact that, as before stated, the death adder is shown by dissection not to belong to the sub-order of *viperidæ* of Gray, where it is placed by him.

I have given separate descriptions of the diamond and carpet snakes, but I believe it will be found that they are the same. Several specimens shown me as carpet snakes have proved to be diamond snakes, the differences in the descriptions are slight and of little moment, while those of the colour markings are, I think, scarcely to be depended upon, unless very decided.

The small furinas are interesting, as exhibiting the great difference of dental development in specimens which are in other respects so similar.

The Ophisaurus is not a true snake, but I have thought it desirable to describe it as a frequenter of this neighbourhood.

DESCRIPTIVE SPECIMEN TABLE.

Colour, &c.	1	Colour and markings of: head and body.
Head	2	Length: largest circumference and shape.
Superior labial scales ..	3 4	Anterior: size, shape, aspect, &c. Lateral; number, size, shape, colour, &c.
Cranial scales	5 6 7 8 9	Inter-nasal: size, shape, colour, &c. Post-nasal: size, shape, colour, &c. Inter-occular: size, shape, colour, &c. Circum-occular: size, shape, colour, &c. Post-occular: size, shape, colour, &c.
Inferior labial scales ..	10 11	Anterior: size, shape, aspect, colour, &c. Lateral: number, size, shape, colour, &c.
Body scales	12 13	Point of commencement at occiput. Arrangement of shape, thickness, surface, structure, &c.
Abdominal plates	14	Shape and length from point to point: colour, &c.
Caudal scales	15 16 17	Supra-caudal; arrangement of, colour, &c. Sub-caudal; arrangement of colour, &c. Terminal.
Nostrils	18	Aspect, over which labial scale: character of.
Eyes	19	Aspect, shape of pupil, &c.
Dimensions	20 21 22 23	Length of specimen. Length of tail. Greatest circumference of body. Circumference of neck.
Section	24	Shape of vertical section of body.
Fixed Fangs	25	Number and size, external or internal.
Superior maxillary teeth	26	Number of: if grooved or not.
Teeth	27	Palatine and inferior maxillary: characters of
Superior maxillary articulator	28	Size, shape, and aspect, of articulating surface, with malar bone.
Poison gland; or post orbital salivary gland..	29	Degree of development.
Size	30	Greatest size to which the variety is known to attain.

SPECIMEN I.

LIZARD SNAKE, *Ophisaurus Australiensis.*

1. Olive brown back from nose to tail, shading to pale drab on abdomen; extending from the neck to near the tip of tail, are three rows of very small black spots—one is situated over the spine, and one on either side of this, distant about a quarter of an inch, the individual spots having a similar space between them; the lateral markings are most developed. On either side of neck are three or four irregular, longitudinal, dark, spotted lines. 2. Three quarters of an inch long, four tenths broad. The vertex falls from occiput to tip of nose: laterally the head is broadest at base of skull—nose fine. 3. Very large, base broad and flat, upper margin semicircular, anterior. 4. Eight, dark drab; the fourth, which is infra orbital, has a dark spot in centre. 5. Two, laterally long, anterior posteriorly narrow. 6. Behind number 5 are two similar scales, then a row of three, consisting of one central and two small lateral. 7. One large central shield, with two small scales on either side of it, the anterior one of the two being the largest. 8. Twelve or thirteen irregular small scales, the superior being the largest. 9. Behind central shield are two large scales, and behind these, two disgonally placed—long, narrow, scales. 10. Large, base anterior and broad. 11. Six, the two anterior large. 12. Behind number 9. 13. Very regular, scales particularly square, and having a limited amount of connecting tissue, giving the appearance of skin being tight; each scale is keeled, though not prominently. 14. Two, sexagonal and very regular to vent; at this point, and connecting the rudimentary posterior extremities, is an arched row of square scales, the convexity of the arch being anterior, and each scale having a small notch in the posterior edge—posterior to vent the plates are single, short, and narrow, becoming shorter and broader gradually to tail; on each side of, and between each two of these, is a large sexagonal scale. 15. Irregular, small, and generally in a marked degree square shaped. 16. Irregular and small, some few sexagonal. 17. Abrupt and soft. 18. Anterior, superior, and lateral, placed at lower edge of the inter-nasal scales, between these and first lateral superior labial scales. 19. Lateral, over fourth lateral, labial scales: they are surrounded by finely scaled palpabræ. 20. Twenty four inches. 21. One and half inch. 22. One and half inch. 23. One and three eighths of an inch. 24. Round. 25. None. All the teeth very small. This reptile, which is evidently a connecting link between lizards and serpents, is as timid as it is innocent: it abounds in the neighbourhood of Coogee, and appears as much at home in the water as upon land. If it loses a portion of its tail by accident, it is often reproduced double. The length of tail is characteristic. It is very tenacious of life.

SPECIMEN II.

DIAMOND SNAKE, *Morelia Spilotes.*

1. Black ground, mingled with bright yellow, former preponderating; each scale has a small yellow centre spot, with a black margin, producing thus the above mentioned general effect; there are also three rows of diamond-shaped and much paler yellow spots, varying in size from a quarter to three quarters of an inch in length, by about two thirds of the same in breadth; one row is dorsal in situation, and two are lateral; under jaw white, abdomen of a yellow white, mingled with black stripes, one being on the posterior edge of each abdominal plate; these are not regular in width or arrangement; the two colours are sometimes mottled, and vary much in their proportion; processes of the yellowish white of abdomen project upwards at intervals corresponding with the dorsal markings of pale yellow. 2. Broad at base, narrow at nose, flat, length two inches and three quarters, circumference four inches and one third at base. 3. Large, triangular, base inferior; a prominent narrow, but rounded ridge, extends from centre to each angle, in the angles of which are three depressions, the two superior being much the deepest. 4. Thirteen—the posterior and inferior half or two-thirds of each is white, and the anterior and superior half or third of each black; the anterior scales are the largest, and they diminish in size towards the posterior. The anterior first three are centrally fitted, the first most so; the depression is parallel with the longitudinal edges of the scales. 5. Two, triangular. 6. Several, irregularly placed, more or less quadrangular and small. 7. Several, four rather larger than rest, surround a small nearly round shield. 8. Eleven, small. 9. Numerous, small, and irregular. 10. Small, triangular, and anterior. 11. Sixteen, white, a few with slight black marks. Nos. 8, 9, 10, 11, 12, 13, and 14, are more or less hollowed, on external and lower two thirds—thus the upper edge retains its line with the next to form the lip, but, tracing the outer surface of the scale downwards, it is found to recede much in the centre, the edges remaining prominent, and again projecting at lower edge, forming thus a deep hollow of an oblong form, from above downwards. The numbers 10, 11, 12, are the most deeply pitted. 12. At about half an inch posterior to eyes. 13. Regular, lanceolate; the scales are thick, finely striated, and overlap considerably. 14. Very short, sexagonal, not more than three-fifths of an inch from point to point, at either end is a similar shaped shield, rather more than one-third this length, the pointed extremity of which is received between two abdominal plates. 15. Similar to body. 16. Two, regular; fissure between them nearly straight from vent to tip of tail. 17. Very small. 18. Lateral, over second labial scale. 19. Lateral, over sixth and seventh labial scale. 20. Six feet and four inches. 21. Nine inches, vent of some specimens possess a hooked process on each side, which are the extremities of rudimentary hind limbs. 22. Five inches and three-tenths. 23. One inch and seven-tenths. 24. That of a short vertical oval, with one end flattened. 25. None. 26. Nineteen, anterior large, and turned much backwards near the base, posterior small. 27. Palatine small, about in number; inferior maxillary nineteen; the anterior large, and more upright than those of the inferior maxillary. 29. None known to exist. This beautiful snake inhabits the bush, also rocks, and is generally found near water; it often ascends small trees, and is active as well as graceful in its movements. Timid, in common with its tribe, it does not hesitate to strike at man, if turned to bay and enraged. I am not, however, aware of any instance of its having encircled round the limbs or body of a human being; its attack may be looked upon, therefore, as strictly defensive. In the northern, and other genial districts, it attains a size of twenty feet in length. It kills by constriction, seizing its prey by a hind extremity, and rapidly surrounding it by coils of its body, without any regularity of arrangement. Mice, rats, birds, oppossums, &c., form its chief food. If annoyed by a small animal, it will kill, but not eat it, unless requiring food.

SPECIMEN III.

CARPET SNAKE, *Morelia Variegata.*

1. Olive brown ground, with small, dull, orange coloured patches, each of which is edged by a black rim; one patch passes more or less irregularly over spine; one, with an orange black edged ring, is placed at base of skull; on sides of body the patches become lighter towards stomach, which is irregularly light drab, with black markings projecting downwards from sides, at regular distances. Head dark, possessing many patches of colour similar to those on body, but irregularly placed. 2. One and one-eighth inch long, three-fifths broad, triangular, obtuse nose, flat vertex, broad at base of skull. 3. Triangular, dark, with raised centre; three-leaved, thus—one leaflet projecting upwards; between each leaflet and the light edge is a marked elliptical depression. 4. Fourteen; three anterior are depressed at posterior superior corner; anterior third of anterior scales dark, remainder white. 5. Two, rather large. 6. Behind No. 5, two rather smaller, and from these, posteriorly, as far as eyes, are a large number of very small, roundish scales. 7. In centre are three rather irregular, largish scales, between which and superciliary scales, are a few small and irregular scales. 8. Ten, besides the seventh and eighth superior labial. 9. Irregular, and very small. 10. Triangular, small aspect, anterior and inferior. 11. Nineteen; the anterior long, from above downwards, and narrow from before to behind; 9th, 10th, 11th, 12th, 13th, 14th, and 15th, pitted, the centre ones very deeply, the depression being nearly square. These scales are much broader than the anterior. The edge of lip is especially

Fig. 1.

Fig. 2.

Fig. 3.

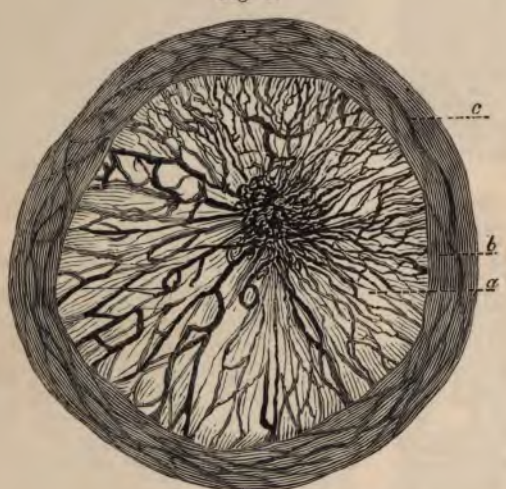


Fig. 4.

Fig. 1—The upper (or inner) surface of the lower jaw of a Death Adder, showing the cavities which receive the fixed fangs, when the mouth is closed—*a*, inferior labial scales of skin—*b*, inferior maxillary bone—*c*, cavities to receive fangs.
Fig. 2—Section of ordinary vascular tumor, viewed as an opaque object.
Fig. 3—Thin section of venom gland, viewed as a transparent object.
Fig. 4—Same as fig. 2, but acted upon by acetic acid, and more highly magnified.
Fig. 5—Lateral section of an injected venom gland—*a*, general saculated structure, showing roughly, the proportion of blood vessels in, or the vascularity of, the gland—*b*, aponeurotic sheath—*c*, branches of main duct in section.
Fig. 6—Structures of venom gland highly magnified. 1. Portion of injected sacular structure. *a*, sacule walls—*b*, sacule cavity—*c*, inter-sacular blood vessel. 2. Fibrous tissue of aponeurosis. 3. Appearance of inner surface of sacule walls when in focus, a nd showing the free extremities of the cells. 4. Cells from sacule walls, variously magnified.
Fig. 7—Enlarged view of a drop of venom when dry, showing the degree and mode of its contraction.
Fig. 8—Corpuscles found in venom.
Fig. 9—Same as fig. 8, acted upon by acetic acid.

Fig. 5.

Fig. 6.

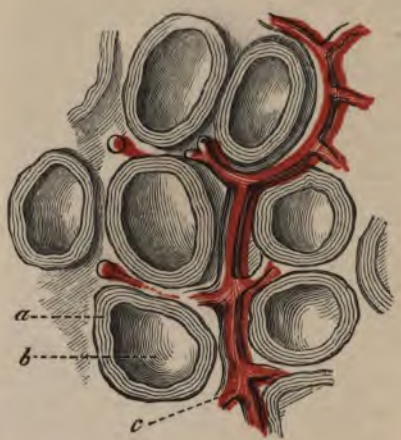
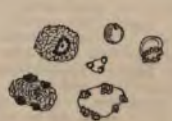


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.



prominent, colour white. 12. On line with gape. 13. Small, lanceolate, and finely striate. 14. Six sided, one-fifth of inch, and comparatively narrow. 15. Continuation of back scales. 16. Two, six-sided. 17. Abrupt. 18. Lateral; on upper edge of large scale, over second and third superior labial. 19. Vertical. 20. Two feet eight inches. 21. Four inches. 22. Two inches. 23. One inch and three-tenths. 24. Long, egg-shaped, smallest point inferior, no hooks to be seen externally at vent. 25. None. 26 All smooth, the anterior large. 27. All smooth. 28. No true horizontal articulation. 29. None. 30. Said to attain 18 feet in northern districts. General Remarks.—The specimen from which the above description was taken, was small but beautifully marked. I had it in my possession some time, and found it timid and indisposed to take food; it was the only specimen I have met with possessing any decided difference of markings to the diamond snake, with which I think it will be found to be identical.

SPECIMEN IV.

The Tree Snake.

1 Dark olive brown on vertex, rather lighter on back, from under the jaw to region of heart bright yellow; from thence to tip of tail the abdomen is of a light drab; the lower portions of the sides being yellow. 2. One and one-tenth long, six-tenths broad, a long oval antero-posteriorly; vertex flat. 3. Five sided, apex above, large, it articulates with six scales. 4. Eight, white, shaded posteriorly to a light olive brown; posterior scale very large and long. 5. Two. 6. Two. 7. Three, central shield. 8. Six; two of which are superior labial. 9. Four; central articulation between two. 10. Triangular; apex inferior. 11. Nine, all white. 12. Posterior to 9, laterally, are two rather large scales, with which the body scales commence. 13. Very regular, scales not thick, one row of six-sided shield-shaped scales extends down entire length of back, over spine, on each side of which the scales are small, the more inferior ones becoming large as they approach the abdominal plates. 14. Very long, and irregularly six-sided; the shape is peculiar; it is composed of a central and two side portions, the structure of the three being continuous; the central portion, representing the true abdominal plate, is quadrangular, having an anterior concave, a posterior convex, and two lateral straight edges, the two former articulate with the anterior and posterior abdominal plates, while the latter send elongations up the sides, quadrangular in shape, each adjoining, two receiving, a body scale between their points. 15. Irregular from over vent, for one inch and a quarter, then two central scales, with one lateral scale intervening between the former and the sub-caudal plates. 16. Two from vent to tip, irregularly six-sided, bent to an angle; in centre of each, like the abdominal plates, the two centre halves of each side, and adjoining each other, forming a flat sub-caudal surface; this arrangement is as if the abdominal plates were continued as sub-caudal, but divided in the centre. 17. Small, abrupt, and short. 18. Lateral, over the second superior labial scale. 19. Lateral, over the sixth and seventh superior labial scale. 20. Four feet and four inches. 21. Thirteen inches and a half. 22. Two inches and one-third. 23. One inch and six-tenths. 24. This is peculiar, and differs from other snakes; it is an elongated semi-circle, with a straight line from point to point. The angles are formed by the line of union, between the central and lateral portions of the abdominal plates, and by the centre of the sub-caudal plates. 25. No fangs. All the teeth, superior and inferior maxillary and palatine, are small and regular in size. This very graceful snake is an inhabitant of trees, and often climbs portions of houses, verandahs, &c. I am unable to speak of its food or habits, but should suppose the former to be composed principally of the larger kinds of insects, small birds, &c. In growth, it increases principally in length.

SPECIMEN V.

Black Snake—(Sexa-dental).

1. Black from nose to tip of tail, on head, back, and sides, abdominal plates, bright salmon anteriorly, slate posteriorly, the lowest plate being entirely bright salmon in centre—tail, slate coloured, on abdominal aspect. 2. One inch and one-fifth long, nine-tenths broad; nose obtuse; greatest width at occiput. 3. Large, triangular, apex superior, superior angle rounded, reddish in colour. 4. Six, large, black; first rather red. 5. Two; narrow antero-posteriorly. 6. Two; large. 7. Three, centre, shield; all large. 8. Six; including third and fourth superior labial, and one supra-orbital of No. 10. 9. Two, large, vertical; and two rather large, lateral. 10. Small, triangular, and rather red coloured. 11. Six, large, black. 12. Behind number 9. 13. Very regular, each rather prominent and polished; very movable upon each other. 14. Long, six-sided, one and three-tenths of an inch. 15. Body scales continue to one inch behind vent; then a central shield surrounded by seven scales, ordinary body scales then again occur to tip, but with a certain amount of regularity. 16. Six abdominal plates after vent; from thence to tip the plates are double—the tail terminates suddenly. 17. Abrupt, soft. 18. Lateral. 19. Lateral; pupil round. 20. Three feet two inches. 21. Six inches and a half. 22. Three and a quarter inches. 23. Two and a half inches, but the skin is capable of distension, under the influence of anger. 24. Flat, oval. 25. One in each superior maxillary bone, generally external, one-third of an inch. 26. Five, small, short, rounded and smooth, without groove. 28. Highly developed. General remarks.—In one well injected specimen, I could readily make out, when examining the highly vascular mucous membrane, in which the supplemental and rudimentary fangs lie imbedded, that each had its distinct fold of membrane, that of the functional fang being the most marked; also, that from a point opposite the centre of the duct, at its insertion into the fang, arise two pillars of fibrous tissue, which pass backwards, in the form of, or having the appearance of, large mucous pillars, which pass on either side of the functional fang, surrounding it at the base and terminating in the loose membrane of the sheath. This snake inhabits marshy districts, and sometimes, if not frequently, takes to the water; it feeds principally upon the small animals, which abound in these situations; when enraged, it quickly distends the neck, raising the head at the same time; upon finding itself observed, it will always retire, unless actually attacked, and even then it usually does so; if, however, it is brought to bay, it will not hesitate to show fight and strike; I am informed it will coil round its prey, but this I have not seen. It grows to the size of eight feet in length, but increases far more in circumference than length, proportionately. The skin carries a fine gloss, and is of a fine jet black; nevertheless, this reptile has a singularly disgusting appearance, especially when of large size. This snake cannot belong to the tribe protroglypha of Dumeril and Bibon, as the fangs, in common with all that I have examined, are, physiologically speaking, tubular, as much so, indeed, as those of the death adder or rattlesnake.

SPECIMEN VI.

Brown Striped Snake (Sexa-dental).

1. Olive brown on vertex; back, bright nut brown, in alternate light and rather dark bands, the scales are of one uniform colour in the dark bands, but in the light coloured bands the overlapped edges of the scales are much lighter; back of tail is darker than of body; belly, a dingy yellow. 2. Three-quarters of an inch long, five-eighths of an inch broad, vertex flat, aspect, sinister and fierce. 3. Semi-circular, anterior, apex superior. 4. Six, dingy olive brown, the posterior are the largest, the anterior the smallest, and the intermediate graduate between them. 5. Two. 6. Two central, and one lateral, the latter in front of each eye. 7. Three; the external being super-ciliary, and the central forming a shield; the apex being posterior. 8. Six, the one super-ciliary of No. 7, two central (Nos. 3 and 4), of superior labial, and the remaining two posterior. 9. Four, the two central very large. 10. Triangular, small, and aspect inferior. 11. Seven, the five posterior very large, and the two anterior quite small. 12. Immediately behind number 9. 13. Very loose, the connecting tissue being very loose and elastic. 14. Very long, quadrangular, seven-eighths of an inch. 15. Same as dorsal. 16. Plates, same as abdominal, reduced in proportion. 17. Irregular and soft. 18. Lateral, over first

superior labial scale. 19. Lateral, round pupil. 20. Thirty one inches. 21. Four and a half inches. 22. Two and a half inches. 23. One and three-quarter inches. 24. Rather flat oval. 25. One in each superior maxillary bone, generally external. 26. Six, small, rather flat, laterally; points well set, back deeply grooved. 27. Small and regular. 28. Moderate, and not quite flat. General Remarks.—This snake is found principally in moist ground, and more particularly on the margins, or in the neighbourhood of swamps; it readily takes to the water, and may sometimes be seen floating lazily upon the surface, enjoying the warmth of the sun; it is very active, and though, like all serpents, it prefers retreat, when molested, it is far more ready to turn and become the attacking party, than any other serpent of this country; when once roused it is most determined and active, not hesitating to chase a man, whether on horseback or foot; when in confinement, it shows the same disposition, being always on the alert and ready to defend itself by the use of its fangs. It is highly ravenous, and takes food greedily and actively to the exclusion of any other inhabitants of the same case; if disturbed in its attack upon prey, by a large diamond snake, it will threaten and overawe it, though less than one-sixth its size; when enraged, it widens its head fully one-third, and, if anticipating food, freely stretches all the joints of the head engaged in mastication; its bite is quickly fatal to prey; when it seizes an animal it holds on as long as possible (from two to eight seconds), but then usually appears satisfied, merely following and watching its victim, occasionally however, it seizes it a second time in the same manner. I believe I have observed that it usually strikes about the neck or shoulders.

SPECIMEN VII.

Acanthorphis Brownii—Death Adder—(Quarto-dental).

1. Head, olive brown and grey, mixed, olive-brown over back, with intermediate and narrower brownish grey bands over back and sides; at the posterior margin of these, every other scale is gray, and projecting, as it were, into the darker brown band, these latter are darker in colour towards the tail; the head is covered with brown and grey scales mixed irregularly. 2. Very flat, broad, nose pointed, length one and three-tenths of an inch; breadth, one and one-fifth of an inch. 3. Broad at base, apex round, nearly semilunar, brown, aspect anterior and superior. 4. Six, smallest in front, two posterior very large, colour brown and light cream. 5. Two, rather small. 6. Four, regular. 7. Three, the external two are superciliary, the central forms a shield. 8. Six on left side, seven on right, the one superior scale being the superciliary of No. 7. 9. Two central, large; a few rather large and irregularly arranged laterally. 10. Small, triangular, apex inferior, aspect anterior and inferior, brown, but white in centre. 11. Eight, rather large and deep, centre of each, dark brown, circumference white. 12. Behind No. 9. 13. Quadrangular, when magnified are seen to be finely speckled with brown and white, or white and brown, the individual colour predominating to produce the light and dark scales, they are very loosely connected together, they are also thin, not polished, keeled, nor striated. 14. Long and band like, rather broad and six-sided, nine-tenths of an inch long, anterior portion of each dark mottled brown, posterior whitish. 15. Similar in body, reduced in number and size. 16. Posterior to vent are 24 reduced abdominal plates, and posterior to these 24 pairs of double plates. 17. Slender, long, finely pointed, extremity turned up. 18. Lateral, slightly superior, each is small, in centre of a large scale over first and second superior labial. 19. Small, lateral, deep set, pupil round, supra-orbital ridge prominent. 20. Twenty one inches and a half. 21. Four inches. 22. Three inches. 23. Two inches. 24. Flat oval. 25. One in each superior maxillary bone, generally external, strong and long. 26. Three, smooth. 27. Palatine, fifteen, very small, inferior maxillary, seven very small. 28. Highly developed, flat, horizontal, round, or nearly so. 29. Large, highly supplied with blood, prominent in cheek. The death adder is generally found in dry sandy bush, but does not object to warm swamps; it is especially fond of basking in the sun on a sandy path or a dusty road; at such times it is very likely to be mistaken for a portion of stick or bark; secure in its sense of power and unattractive appearance, it seems neither to apprehend or appreciate danger, and may be driven over or trodden upon without moving; when fairly experiencing pain, however, it at once becomes the attacking party, and displays an unexpected amount of determination in striking; if approached slowly, and at the same time closely, it lies immovable—perfectly inanimate, while the small bright eye is making its calculations; suddenly, and in a moment, it strikes, instantly resuming its former position and inanimate state; I have observed that the blow is never directed straight. When confined it shows the greatest curiosity for some days, and will leave no attempt in its power unmade to test the strength of its case, but once satisfied that escape is impossible, it becomes quiet. I have been unable to get them to take food in confinement, though they would follow it about, apparently desirous of doing so.

SPECIMEN VIII.

Small Ringed Coluber, or Furina—(Octo-dental).

1. Crown of head black, with narrow, white, transverse stripe, over occiput, body white, with narrow black stripes, extending to commencement of abdominal plates on either side, the black band is about one-ninth of an inch in breadth, the intervening white space about three-eighths of an inch, under jaw and belly white. 2. Small, narrow at base, comparatively, rather broad at nose. 3. Triangular, base inferior, apex broad and round. 4. Six, white, large, especially the posterior one. 5. Two, narrow antero-posteriorly, adjoining edges, central. 6. Two large, adjoining edges central. 7. Three, the two external are superciliary; the central forms a large shield. 8. Six, the two inferior are labial, and the one superior is the superciliary of No. 7. 9. Two, large and triangular, apices posterior. 10. Small, triangular, apex inferior. 11. Six, white, rather large. 12. Abrupt, behind No. 9. 13. Closely fitted together; skin well filled by natural tissues. 14. Long, narrow and six-sided; three-tenths of an inch. 15. A line of junction between two scales is carried to tip from vent. 16. Abdominal plates divided into two, from vent to tip. 17. Simple, folded once. 18. Lateral, over first labial scale 19. Lateral, slightly anterior and superior; pupil round. 20. Eleven inches. 21. One inch and three-quarters. 22. Seventeen-twentieths of an inch. 23 Half of an inch. 24. Round, or rather a flattened round. 25. One, external, highly developed. 26. Eight, smooth, 27 moderate about eighteen. 27. Horizontal, flat, 29, moderate. General Remarks.—Of the habits and food of these snakes I cannot speak. I have kept one alive for about four months, three-quarters of which time was warm weather, I could not get it to eat; it was offered milk, various kinds of insects, small frogs, &c. When displeased, it expanded and flattened the head. I have seen several specimens, all of which were about the same size, the manner of that which I had in my possession, was similar, though less fierce, to the brown ringed snake.

SPECIMEN IX.

Small Black-headed Coluber—(Furina, Octo-dental).

1. Head black over vertex and nose, the same colour over back of neck, a white stripe or collar passing over base of skull, except over centre, where the black markings unite; a smaller black mark is placed over the spine a little lower down the neck; body, cream coloured; belly white. 20. Twelve inches. 22. Nine-tenths of an inch. 23. Six-tenths of an inch. In all other respects similar to specimen 8 (small ringed coluber).

SPECIMEN X.

(Bi-dental Furina).

1. Head cream coloured, with black crown, and a second black patch behind this, under jaw white, body uniformly cream coloured, abdomen white. 2. Small, oval, rather broad towards nose. 15. One central row of rather large scales for certain distance behind vent, which are converted into regular lenthened plates at a short distance from tip of tail to the terminal scale. 16. Abdominal plates continued, as sub-caudal, from vent to tip. 17. Soft and folded, showing its formation by the overlapping of two. 21. One inch and six-

tenths. 24. Round. 25. One, external, highly developed. 26. One or two. 27. Palatine, 20 in number, highly developed, inferior maxillary, twenty, small. 28. Large, horizontal, nearly flat. 29. Well developed. (2). In all other respects similar to specimen 10.

SPECIMEN XI.

BROWN SNAKE, from the Island of Dirk-hartogs, Shark's Bay.

1. Fine dark brown on head and anterior third of back, on posterior two-thirds of back the former colour is alternated by narrow, irregular, and mottled stripes of brown, two shades lighter; extending from the occiput along the anterior, three-fifths of each side of body, is a faint narrow and longitudinal line of lighter colour; under jaw white, belly dusky brownish drab. 2. Length one inch and one-fifth, circumference two inches and one-eighth; shape, long and narrow, broadest at base: nose rather broad. 3. Anterior, large. 4. Thirteen on one side and twelve on the other; the first small, the second large and quadri-lateral in shape; from this to twelve they diminish in size and become long and narrow. 5. Two, rather small. 6. Two, with a central fissure, they are long, narrow, and nearly triangular in shape, their apices being posterior, and having between them a very small roundish shield; on either side of the latter, and adjoining the external and posterior edge of the former, is a quad-lateral, rather large scale, placed diagonally on the side of the head, and having a similar scale, less in size, adjoining its posterior and external edge; between all these and the superior labial scales, are a few small and irregularly placed scales. 7. Three, one central shield, and one on each side of it, superciliary. 8. Seven; one, superciliary (No. 7), two anterior, two posterior, and two inferior, (the fifth and sixth superior labial. 9. Two, central, moderate in size. 10. One, high and narrow, laterally, and not much pointed inferiorly. 11. Nine on one side, ten on the other; the anterior three high and band-like, the posterior ones long and narrow from before to behind. 12. Behind No. 9. 13. Very regular, more or less square, rather thick, connecting tissue loose; from the side towards the abdominal plates they gradually increase in size, becoming also sexagonal, and of a dusky drab colour. 14. Sexagonal in shape, rather narrow, much pointed at extremities, and not more than half an inch in greatest length. 15. Same as dorsal. 16. Eleven or twelve single plates, like abdominal, behind vent, and from thence to tip, two sexagonal plates of half the size. 17. Rather abrupt. 18. Superior anterior and external. 19. Lateral, slightly superior and anterior. 20. Three feet 10 inches. 21. Four inches only. 22. Four inches and four-tenths. 23. One inch and four-fifths. 24. Rather flat oval. 25. None. 26. About 20 or 22, anterior very large. 27. Palatine very numerous, anterior very large, inferior maxillary absent. 28. Not known. 29. Supposed to be absent. 30. Not known.

For Illustrations, see separate page.

WOORE'S PATENT GRATE.

IN our last number we published a paper by Mr. Thomas Woore, on a new description of grate adapted for burning wood, and likely to be very useful in the country districts. We have since been favoured by Messrs. P. N. Russell, and Co., the manufacturers of this improved grate, with an illustration which will convey a much better idea of it than any mere verbal description. There is a patent taken out for it.

The following directions for setting this description of grate may be found useful:—

The Grate is to be placed on the usual stone hearth, about six inches above the level of the floor; its front edge in a line with the front edge of the hearth, and in the middle, between the jambs. No draft to be admitted under the bars.

Then the space between the sides, and back of the Grate, to be filled up with brickwork, the front surface of the brickwork on each side of the Grate, being laid in a curve, extending from the metal arch to the extremity of the jambs.

An arch of half bricks to be turned over the metal arch, and the surface of the bricks continued upwards, each overlapping the other, until the work is brought out to the front of the breast of the chimney. When completed, the Grate will stand in the centre of an alcove, the cove to be finished with the usual lime plaster, and painted black.

Care must be taken to carry the flue as high above the metal as a man can work in the chimney, before closing up the breast.

The wood is to be burned with the ends of the billets pointing outwards, and in the front of the platform, contrary to the usual practice.

CHEMISTRY APPLIED TO AGRICULTURE. BY FREDERICK MUSPRATT, F.C. S.L.

When Sir Humprey Davy published his work on agriculture all that the chemist advanced was theoretical, and facts at present recognised were looked upon as the extravagant dreams of an excited theorist.

The chemist need not now ask people to believe what he dissemminates, with the diffidence which must have attached to his assertions, before innumerable practical results attested that the student who sought enlightenment in the laboratory had proved himself capable of expounding many of the laws of nature. Practical men should now be told that if they do not avail themselves of truths which science develops, they forego the advantages that would accrue to them from a just appreciation of the value of knowledge that has been wrought out in the crucible, and fashioned by the retort.

When Liebig's work on agriculture appeared, he recommended the addition of a certain quantity of sulphuric acid, both in order to render the bones for manure more soluble, and to change the neutral phosphate of the bones into gypsum, and into a phosphate which contains more acid, *i. e.*, superphosphate of lime. No one now doubts the effect of this, and it is proved by the fact that at the present time thousands of tons of this substance are annually manufactured in England, and it forms an important article of commerce.

Chemistry has not yet fulfilled its functions, education in analyses must be more general and facile. Analysis of the soil will show what it is capable of producing, and enable the manipulator to supply those ingredients, the absence of which would prevent the growth of the plant required; or, if not present in sufficient quantity, stay its attaining that luxuriance of which it is capable. What more expressive term can we apply to a garden than to call it the laboratory of nature in which the skill of man is applied.

In medicine, chemistry has pointed out the remedy for many diseases previously supposed to be incurable; diabetes has hitherto baffled its skill, but it will not long do so. Physiological analyses daily going on must lead to successful results. The blood and secretions of the invalid differ in composition from those of a person in health; one ingredient, chloride of sodium or common salt, is often found to be deficient in the sick person, where it would most aid the vital functions. This is a digression, but it seems to me to be apt in illustrating my subject.

Taste and science are essentially different; a woman who cannot read, and without intellectual endowments, may have great taste; witness the Albanian or Italian peasant girls on fête days. Taste is not a mental acquirement, whereas science can only be fostered and lead to discoveries by the aid of a well-developed brain, and intense and prolonged studies.

In an address by Sir Charles Nicholson, I think he blended these two terms too intimately. Taste is stationary, science progressive; taste is innate, science acquired.

In forming gardens in this country we must, to a certain extent, be guided by European models, in order that we may mould the wilderness into gracefulness; and our science must depend on the emanations of men whose lives are devoted to its study. Possessing a different climate, and subject to other influences, we must always use our own judgment in applying our knowledge under these novel circumstances.

We must not, however, forget that the gardens at Aranjuez, the promenades of Lisbon, the *coup d'œil* at Cintra, the gardens at Alton Towers, &c., are far more beautiful than anything improvised by any one who has not seen these places. Let us not be ashamed to imitate, and improve if we can. Owen Jones studied in the halls of the Alhambra what he brought to so successful an issue in beautifying the Crystal Palaces of London and Sydenham.

With regard to the sand drifts near Sydney, I do not coincide with the idea of sowing couch or other native grasses, if placed on land that might in after times come into use for villas and gardens. The person who takes the land will find that this grass only proves a nuisance; and as, during the principal part of the year, it presents a withered straw-brown surface, very disagreeable to look on, and except when very young cattle refuse to eat it, I think the objections are manifold. Some time since I wrote a letter to the *Sydney Morning Herald* on Abbattoirs; if the recommendation therein contained had been applied instead of the ridiculous plan of having them on Glebe Island, and throwing the refuse into the sea, that would have been the first step towards curing the sand drifts; and with regard to the kind of grass to be sown, I think the most likely, nutritious, spreading roots deeply into the ground and lasting, is Italian rye grass. Wherever it has been sown in England, on soil where the roots have had free play, it has proved eminently successful; if manured, it yields proportionately; and if fed off, it has been found to be economical, for a dairy farmer invaluable. I can only speak of Europe, as far as experience enables me; if it suits a hot country like Italy, and thrives in a cold country like England, I conclude it must be a hardy grass.

In the present instance, should the surface not be covered with marl, the addition of lime would prove advantageous, as it disintegrates the selic, which forms the principal ingredient of all grasses, and renders it soluble. To arrive at correct data, as to the efficiency and cost of any plan proposed, the society would do well to institute a series of experiments, trying all suggestions that might appear feasible.

If the object be to make Sydney a pleasant town to live and move in, instead of the opposite, a wider range of subjects must be taken into consideration—an abundant supply of water, proper water tanks and gutters attached to each house, squares and streets planted, and the streets metalled with limestone or cyanite, or anything but sandstone.

The time has come in Europe when chemistry forms an important part in education. The want of a knowledge of this science is a great loss to the statesman. As a schoolboy who takes a glass ul of liquid, and placing a loose piece of paper over it, inverts the glass without spilling a drop of its contents, proves that he has more correct notions of nature and of natural laws than had Plato, so will the schoolboy of the next generation, who will understand the laws which enable

him to produce ice in a red hot crucible, surpass his predecessor; then will the power of the chemist be acknowledged and appreciated.

ON THE CULTIVATION OF THE SORGHUM SACCHARATUM.

MR. PRESIDENT AND GENTLEMEN—

I propose this evening to detail the results of my experience in the cultivation of the Sorghum Saccharatum, and to exhibit the advantages which I believe will accrue to the colony from the introduction of this invaluable plant. I hope to prove to you that it should be regarded as a question of national importance, and that this plant bids fair to promote both the commercial and manufacturing interests of the community. I shall attempt to shew that, while it will impart additional value to the lands, it will increase the comfort and even the luxuries of all classes. The consumption of sugar in this colony, which may, to a certain extent, be regarded as a luxury, is larger in proportion to the population than any country in existence, where statistics are regularly published, and the enormous amount of capital that is yearly expended in its importation need not be here stated. This I believe may be retained in the colony, to be employed in various reproductive enterprises. If I should prove, on the evidence of this paper, that the cultivation of the Sorghum is easy and profitable, and if my experiments should in any way extend its culture, and save those employed in its cultivation from falling into error, it will be a matter of pride to myself to have done some service to the colony.

The Sorghum is a peculiar plant, and is valuable for many different qualities. Under skilful management, I have known it to produce no less than three crops in the course of the year. In spite of wind, weather, or drought, it will yield abundantly; for if the season be unfavourable for ripening the seed we have an excellent crop of green fodder, which is eaten with avidity by all kinds of stock, including pigs; and by cutting the canes at the end of four months you may always depend on another crop within four months afterwards. I can also assert that it will cost less to cultivate 100 acres of the Sorghum than 100 acres of wheat, while the yield is immeasurably more valuable. On the estate of Mr. W. Wilson, at Lismore, Richmond River, I have seen, during the last two years, from five to six crops of green feed per annum, and in that climate we commonly obtain two crops per annum, from which sugar may be extracted, and one crop of fodder. In order to estimate its superiority to wheat, let us suppose that it cost the same in the first instance to place 100 acres under cultivation as wheat, as it does to cultivate the same amount of Sorghum, we must then recollect that on an average we can only have one crop of wheat during the year, and that the produce per acre will be about 25 bushels. Let this be valued at the highest market price, and add to it the value of the straw, and that concludes the advantage derivable from it. For another crop, fresh seed, fresh ploughing, and sowing, is necessary; whereas, in the Sorghum, the plant once stuck in the ground goes on producing crops for the year round, and is not attacked by drought, nor damaged with excessive wet, to the same extent as the cereal crops. If, after planting the Sorghum, we find that during the first two months of its growth the weather has been too wet, and we must abandon the hope of getting our crop of sugar, for the cane might not then yield sufficient saccharine matter, there will still be sufficient to distil a spirit from the juice of the cane; and even if there were not enough of that, we could make vinegar, for even with inferior canes I calculate that the acre of canes will produce 3000 gallons of vinegar, besides having the seed, the leaves, and the refuse, on which to feed the cattle. This we will suppose to be the result of the first four months growth, under unfavourable and wet weather. Within four months after this; if the weather is warm and favourable, we may have a fresh stock of canes, from which we may extract a crop of sugar, or even if the year throughout was wet and disastrous to all other cereal plants, we should, in the Sorghum, have an excellent stock of fodder. In the practice of my profession as a medical man, stationed on the Richmond River, I have had many opportunities of observing the growth of the plant under very various circumstances in different localities, and thus I am enabled to speak so confidently of its value; and I must say that I consider the colony to be under a deep and lasting debt of gratitude to Mr. E. Deas Thomson, for its introduction, and the pains he has taken to distribute the seed.

I will endeavour to point out as briefly as the subject will admit, all matters that have suggested themselves to me with reference to this valuable plant.

Hitherto the Sorghum has been planted with various success, and in general any failure may be accounted for from the fact of the seeds having been planted too deep. Some have used too much manure, and, according to my impression, an improper sort, acting injuriously upon the juice and making it, in manufacturing for sugar, injurious for crystallization. The juice of the Sorghum would not undergo the same process as that of the sugar cane, because the component parts vary, and the juice of the Sorghum is much more liable to fermentation, which I will point out presently.

On the subject, first, of manuring, I will instance my personal experiments, without reference to what may have been written on the subject in other parts of the world. I will chiefly describe the method of planting and manuring for sugar growing (for green fodder it is comparatively of little consequence, because Sorghum might be for such purpose raised on any soil, if not planted deeper than one inch). In manuring the soil, it is important to know what is the most suitable manure, and we must consider the facts that if the canes be grown on soils in which, either naturally or by artificial applications, there are present an excessive quantity of soluble saline matter, so much will be absorbed by the plant, which will seriously injure the crystallization of the juice. Guano manures are violent in their nature, and yield a large proportion of ammonia; they are less fit than bones, either burnt or in powder. Manure of horned cattle and lime would be more fit and less injurious to the sap. If we analyze the ashes of the Sorghum we should

find phosphate of lime, magnesia, acetate and sulphate of potash, oxide of iron, and hydr. silicia. The knowledge of this will enable one to judge what soil is the best to grow sugar, and to apply such manure as will not act injuriously upon the juice. I would strongly recommend, if manure is employed at all, that it should be bone manure. The earthy parts of bones are composed principally of the phosphates and carbonates of lime, in various proportions, together with phosphate of magnesia and fluate lime, in variable quantities. Burnt bones will have lost their earthy residue, which they had previously contained, and will contain substances which did not previously exist in the bones, and which did not form a part of their earthy salts; as, for example, sulphate of soda produced at the expense of the sulphur of the bones, the alkaline carbonate proceeding from the cartilages with which it was combined. On the other hand, the greater part of the lime will have lost its carbonic acid: this manure in either shape must act beneficially upon the plant. Bone manure, in any shape, is good, either in a pounded shape, unburnt—or, if this process, from want of materials, is impracticable, let them be burned, and thus more easily pulverized.

The earth should be ploughed as deep as possible, and cross ploughed, and rolled and harrowed, before putting seed in. The seeds are the better for being steeped for twelve hours in water slightly tepid. This process will, in general, cause their germination four days sooner. The rows should be three feet apart, and two seeds dropped in each hole, of an inch deep (but not more), and at twelve inches apart. I would drop the seeds in each row at intervals, for the reason that it would give the plants greater freedom to clear themselves when leaning over from the wind. If the seeds are steeped, we may generally observe the germination to the surface of the soil in four or five days. If not steeped it might be a week or more. After the germ is about a quarter of an inch above the earth, the little leaves will soon commence to develope themselves. In the first fortnight we may not observe much change. The growth will take its course without any remarkable change, except the development of leaves and knots, till it is six weeks old; then we shall commence to observe roots coming above the soil, and from beneath the lowest knot. These secondary roots sprout out and take their course in the form of a half hoop, going about half a foot underneath the earth, taking their direction in a longitudinal position, and arrive at a length of about eighteen inches. Now the plant, after it has thrown out these secondary roots, goes on with its growth with great rapidity, so rapidly that one may detect the advancement from day to day. By two months more it will have obtained a length of eight or nine feet, and the panicles of seed are in flower; and in less than one month after that the seeds become hard and the cane ripe for cutting and making sugar.

If the canes are allowed to remain longer after the seeds are ripe, in about a fortnight we shall observe sprouting from first, second, and third knots. These will become in another fortnight actual shoots, coming forward between the enveloping part of the leaf and the cane. These shoots will disengage themselves very soon from the parent stem, and the clasping part of the leaf, and, if a foot long, will take their direction downwards; and in two months more they will bear a panicle of seed, not so heavy as that on the mother plant, but the seeds themselves are quite as large. If these are still allowed to remain we shall observe after three weeks, between the lower part of the shoot, roots, which take their direction perpendicularly, these roots come distinctly from the shoots themselves.

(See illustration at the end of this paper.)

After I saw these roots about eight inches long, I cut them off from the old stem, putting them merely in the soil, and in two months after that I got from that single shoot several others bearing seed. I cut the old cane, the juice was very sweet, but not so sweet as from those canes which were cut when the seeds were ripe, this will shew distinctly that for sugar manufacturing the cane should be cut when the seeds are very black and hard, a test that can be applied by pressure or by trying them between the teeth. In case the panicle should be removed from the stock before ripening, which, with a hope of throwing more strength into the cane is occasionally done, we shall be disappointed, for not more than a week will have elapsed before we witness the same growth in shoots, and the stool will throw out several thin canes, each bearing seed, which shews plainly that Sorghum must be left to its natural growth. On one occasion I left twelve canes standing after they had become ripe, for further experiments, and broke from twelve others the seeds before they were ripe, and all the facts did occur as I have related above.

It would appear clear from the rapidity of the growth of the Sorghum, that less manure might be necessary than with the generality of vegetables, for I should have stated that in any one instance I have availed myself of fresh ground, without any manure whatever.

Let me make an observation on the subject of "hilling," or the raising of the soil about the plant. I think this process rather injurious, by having been an eye witness to the fact of its being so.

A heavy storm set in in the month of May last, and lasted nearly twelve hours. I had 220 canes hilled up, and 100 not hilled. I witnessed with interest the struggle. The canes were all seven feet. After a struggle of four hours, the hilled Sorghum was prostrate, though not broken, while the other Sorghum stood the pressure bravely, waving gracefully to the wind. I was astonished and saw the necessity of the roots, which were formed like a half hoop, acting as they did, like supporting wires. The next morning there was not the slightest indication of having suffered at all. Two days after I was obliged to support the hilled Sorghum with sticks.

We have now the cane full-grown, let us see how it is formed. By taking a joint of the cane deprived of the envelope or clasping part, designated by the name of petiole or footstalk, immediately underneath it we find a deposit of white powder cerrosie, which completely covers the epidermis or outer coating of the cane; this deposit is very visible between the knots, and is called cerosie or vegetable wax, because it resembles white wax and burns with a beautiful white flame.

After the cerrosie is removed we come to the

epidermis or outside coat; this is thin and very strong; the filaments are running in one direction from knot to knot. The colour of the outer coat is generally tinted with apple green, yellow rose colour.

This outer coat contains the most chlorophyl, cerosie, and gum, more so than the sugar cane; it is therefore more difficult to crystallize the juice of the Sorghum.

Next we come to the dermis, or inner coating, submitted to a microscope of 600 diameter. It presents an assemblage of tubes side by side; the coats of these tubes are pierced with innumerable pores and full of a yellowish fluid, which is transparent, and has the appearance of the soft sugar of fruits, or grape sugar, and I think by that appearance that glucose is contained in those tubes to a greater extent than the pith of the cane. We next find, between the knots, threads of a yellowish colour, running from one knot to the other; they are united by a kind of pith, which is the actual seat of the crystallising juice.

This pith is nothing else but a mass of globules, containing juice; these globules are transparent, and the whole pith put under a microscope, its appearance will be of a column of stalactites, beautifully white; if immersed in sulphuric acid it changes its colour to brown in the middle, and to yellow towards the edges. On keeping it in the same acid for fifteen minutes it produces disagregation of little grains, almost white, and by degrees will form a kind of jelly of a transparent brownish colour. By putting this upon the filter and washing it, the residue will leave the appearance of a decomposed woody fibre and slimy matter, and will be quite tasteless, neutralizing the liquid totally. The water will have a sweetish taste, and, by evaporating it, we will obtain a sweet thick syrup, not crystallisable, on account of its having been in contact with acid. The best grained sugar will be changed into grape sugar through any acid, and once changed into grape sugar, it will be impossible to change it again into crystals; hence persons trying to make sugar, must be very careful, that accidentally no acids come into contact with the syrup, and cleanliness is therefore one great point in sugar boiling.

The joints of the whole cane are almost the same, only in the lowest part of the cane will be found more crystallising sugar than in the uppermost joints. The canes are generally from 8 to 12 feet high, and in the top part of the canes will be found more colouring matter but less sugar—the colour being of a bright red. After the canes are ripe and allowed to stand, between the last knot and the panicle of seed will be observed, by moving the clasping part, a reddish liquid of slightly sweetish astringent taste. Between the epidermis will be remarked a quantity of small insects of an ash-grey colour, and of the appearance of small beetles. From what they are composed I have not been able to ascertain, but hope to do so later. The existence of these insects suggests the belief that the Sorghum should be cut when ripe, that when the seed proves hard—so that these may not propagate, fall down upon the f the plant, and be injurious to the following crop, as st

I only observed these insects on over ripe canes.

One acre of Sorghum will yield, on the average, 30 bushels of seed, and will grow 50,000 canes. These 50,000 canes will yield at least one ton of sugar from each crop. The seed is valuable for several purposes, as food for man, fowls, horses, pigs, &c; for starch, spirit, beer, and dye. I have malted the seed, and obtained a good spirit.

The exterior pellicule is of a dark purple colour, and the inner coat of a brown yellowish colour. This derm is so intimately a part of the composition of the seed proper, that I think it an impossibility to separate it except by the process of pearling applied to barley. By boiling the exterior part in pure water for half an hour and immersing a piece of silk, wool, or cotton, it will assume a purple colour; this colour is easily fixed with different salts, acids, or alkalines, so that it stands washing, and different shades can be given to it by other processes; for instance, put into the decoction a few drops of nitric acid, it will assume at once a bright red colour. The internal coat will, by boiling, give a yellowish brown colour, and by putting a solution of potashes a bright yellow will be obtained. The salts of the colour are easily obtained by evaporation or precipitation. I obtained purple, red, brown, orange, yellow, and blue. The hulls, after pearling from the seeds, will at once become an article of industry for the artist, painter, and dyer. As stated before, one acre will yield from each crop one ton of sugar, and 30 bushels of seed, and about 600 cwt. of leaves and tops. Three crops can be grown in a year, but the third crop would probably not have sufficient saccharine matter for making sugar, therefore, the third crop is best applied for food for cattle, and would yield about 25 tons. After cutting the third crop, ploughing, raking, and sowing, has to be done. The above shows an enormous, almost fabulous yield, but it must be borne in mind that my experiments are only of the climates of Moreton Bay and Richmond River, and I am not able to judge of the probable yield in the climate of Sydney.

Sorghum juice varies very much in richness according to the nature of the soil, culture, and season, and the character of the seed itself. It is an opaque fluid of a dull grey colour, in taste sweet, balmy, exhaling the balmic odour of the canes, slightly viscid, and of a specific gravity varying from 1·033 to 1·106, of course according to circumstances.

When fresh it consists of two parts, one liquid, the other solid, the latter being merely suspended in the former, and therefore separable, in a great measure, by filtering and repose. The solid matter consists of the fragments of the cellular parenchyma of the cane. Its fibres are bark mechanically protruded through the mill, mixed with an abundance of greenish substance, called chlorophyle, by chemists. If the juice is left to itself it runs rapidly into the aceteous fermentation, and fifteen minutes is sometimes [illegible] ing on this destructive change [illegible] e necessity of a speedy pr[illegible] n when thus deprived [illegible] albumens, [illegible]

and from the filter it should at once flow into the clarifier. Slaked lime is then mixed with some juice, uniformly, and put into the clarifier. If an albuminous be used to promote the clarifying, very little lime is required, in fact, the lime and alkalis in general, when used in small quantities, seems to coagulate the glutinous extractive matter of the juice, and thus tend to brighten it up, but if an excess of temper be used the gluten is taken up again by the strong affinity which is known to exist between sugar and lime. Excess of lime may always be corrected by tanin or alum water. It will be found that weak sugars contain inferior proportions of carbon.

A viscous syrup, containing much gluten and sugar altered by lime, requires a higher temperature to enable it to granulate, than is requisite for a pure saccharine syrup. In confining myself to the above remarks I purposely abstained from dwelling upon the entire process of making sugar, however, that process is well known, yet unless it is carried out with a practical knowledge it will lead to disappointment and failure. Many methods applicable to sugar of Sorghum are published, but I differ from them altogether, and naturally I prefer my own method, by which I have obtained a most satisfactory result, namely, that of 2¼lbs. of sugar from 3 gallons of juice. My process is entirely new, and applicable to the juice of sugar cane just as well; the fermentation of the juice is impossible according to my method, and the juice may be kept for any length of time without fermentation. The last canes I analysed were from another part of the Richmond River (about 40 miles distant) from a clay soil, and gave the following result at 8¾ degrees Beaumé :—

Crystalline Sugar	17·94
Water	79·80
Mineral substances..	1·14
Organic matter, different from Sugar	0·12

From mineral and organic substances yielded oxide of iron, sulphate and phosphate of potash, cholorure of potassium, acetate of potash, acetate of lime in the greatest proportion, and gelatinous silicia.

From these results will be seen that guano will act injuriously upon the plant, and if manure is necessary, bone and lime manures are preferable. Ammonia will always be present in the soil, combined with the phosphates, which are the most important, and are so, to say, the bone and sinews of the plant, while ammonia, however so little present, supplies them with their indispensable element, viz., azote. Their carbon, hydrogen, and oxygen, are derived from the air and water.

Let us now compare the Sorghum with its rival the sugar cane. The sugar cane is too well known to require much description.

From the planting of the sugar canes till they are ripe, it takes, according to circumstances, from twelve to fifteen or eighteen months. A fine average crop, under favourable circumstances, yields from 1½ to 2 tons dry sugar per acre. It is necessary to change the cuttings of the canes from the other plantations, as they are apt to degenerate, being kept in the same soil. The canes rattoon in general in twelve months from the time of cutting, and each time the rattoons are less juicy, and there exists a greater amount of woody fibre in proportion. During this long growth, what casualities may not occur: fires, storms, severe droughts, and at last white ants, and I am sorry to say this colony abounds with these troublesome guests.

The Sorghum, on the other hand, needs only four months to its complete maturity, and even less for ratooning; and, further north of Moreton Bay, we may safely reckon upon three crops of sugar per annum.

The leaves of the Sorghum are always fresh and green—even after maturity, in consequence not so liable as sugar cane to take fire, the leaves of which become dry and fall.

The Sorghum is produced from the seeds, therefore no deterioration can occur as in sugar cane. It will yield a crop of rattoons in seven or eight months from the time the seed is put into the ground, being consequently two crops in that space of time, and will continue ratooning, if climate and season are favourable.

About the casualities which occur in this country, I can speak of last year's experience, when it was uncommonly hot, with a heavy drought, and potatoes, cabbage, maize, suffered severely; the sugar cane did not suffer, except so far that I saw no progress in growing, and the leaves being dried up. The Sorghum was fresh and green, without the least signs of dryness. I made another important observation: in the stalks of the sugar cane, one foot above the soil, there were white ants going internally through the footstalk into the stool of the plant. I watched the Sorghum with some anxiety, thinking that it would be subjected to the same fate, particularly as it was planted in the same square with the sugar cane; however, to my satisfaction, I found that none were attacked; and, further, I came to the belief, that the Sorghum will remain entirely free frem them, because I uprooted one of the stools of the sugar cane with all its inhabitants, and threw them right between the Sorghum canes, but none of them were attacked. Perhaps this might be attributed to the fact of the Sorghum being covered with more wax and gum than the sugar cane.

The Sorghum is not so liable to suffer through storm as the sugar cane, which is brittle, higher, and heavier, and more subject to fall and break. The Sorghum has the advantage of being naturally elastic, and can stand the pressure of the wind; the leaves also are smaller, and it can therefore be planted closer, which makes up for its smaller weight as compared with the sugar cane. The best way of planting it is to make the rows three feet apart, so as to allow sufficient room for a surface plough to pass between. If two seeds are dropped twelve inches apart, we may be sure that if the seed does not drop deeper than one inch, one of the two seeds is sure to come up.

I think that in the environs of Sydney one crop per annum of Sorghum for sugar might be planted to advantage; if sown in October, in February the crop would be ripe for manufacturing, and in the month of May there would be a good crop for green fodder. In Moreton Bay and Richmond River I prepare the soil for

sowing in June and July; in August the seed is put in, and in the latter end of November one crop is ripe for sugar; in March the second crop will be the same, and the third crop for fodder will be in May.

This fodder is left remaining to grow, and is only cut off by degrees, that the land is required for ploughing, so that by August the entire land be ready for seed again. The green stuff is easily cured by stacking it after it is dried, and the cattle eat it as greedily dry as green.

The seed of the Sorghum is so very equal, that from two inches to thirty inches apart may be sown by those machines now in use (as sold by Mr. Hebblewhite, in Pitt-street) either by hand or horse. One man can sow, with such a machine, a great many acres in one day, which at the same time drills, drops the seed, and covers it as deep as any seed may require.

The frost has no effect upon green stuff, but it is otherwise upon the canes for sugar; if the canes are ripe, one night's frost will do so much harm to the juice as to render the crystallisation very difficult.

On communicating these observations to you, Mr. President and Gentlemen, I have endeavoured to avoid as much as possible all technical terms, so that every one who wishes to try the Sorghum, may benefit by the experience which I have so far gained in it by bestowing a good deal of attention, time, and labour, upon it. I trust my observations will be found correct, and will be corroborated, and I hope the Sorghum will assist to advance Australia.

J. W. GUNST, M.D.

The Sorghum Saccharatum, shewing the roots that sprout from the shoots after the seed is ripe.

OZONE.

Many enquiries having been lately made respecting the nature of ozone, and the object of the ozone observations made by meteorologists, the following extracts may perhaps be acceptable.

REPORT OF THE COUNCIL OF THE BRITISH METEOROLOGICAL SOCIETY, READ MAY 23, 1854.

Among meteorological phenomena, attention has recently been drawn to certain effects produced on chemical test papers, when exposed to atmospheric influence, which it is inferred are produced by the presence in the air of a chemical element or compound ozone, varying in the intensity of its re-action or amount under different circumstances. The term was applied in 1840, by Schönbein, to the peculiar odour perceptible during the action of a powerful electric machine, and in the decomposition of water by the galvanic battery; it was afterwards ascertained that a similar smell is developed by the influence of phosphorus on moist air, and in many instances of slow combustion.

For some time the existence of ozone, as its name indicated, was recognised by the odour alone, that being its sole known character; but another fact was soon established, that some element of the atmosphere, endowed with some peculiar smell, possessed also an oxidizing power. The evidence then of the existence of ozone depends entirely on these two characters. In experimenting in closed vessels on a limited scale, it is possible to demonstrate both of these properties, and hence the existence of a new compound or modification of matter has been inferred, differing probably in its nature according to the process employed.

Thus when an odour and oxidizing agency are imparted to an atmosphere by means of electric sparks, nitrous acid may be generated possessed of the same characters; when similar results accompany the decomposition of water by the voltaic pile, a hyperoxide of hydrogen may be produced; and when phosphorous acts on moist air, the same or an analogous oxide may be developed; when, however, we direct our attention to the atmosphere, it will be impossible to detect ozone by more than one character, viz., its oxidizing property, which is common to many other bodies, such as nitrous acid, which may be generated by atmospheric electricity; and hence it will be somewhat premature to decide as to the exact nature of the oxidating power, until more satisfactory information has been obtained with reference to artificial ozone. Bearing in mind, then, the limited condition of our knowledge on this subject, and understanding by the term ozone, when applied to the atmosphere, a peculiar oxidizing state of the air, it is highly desirable that a connected series of experiments should be made in different latitudes.

In the newly printed meteorological form, two additional columns have been introduced for the reception of ozone observations, according to the methods adopted by Drs. Schönbein and Moffat. In use, Dr. Schönbein's paper requires simple suspension in a situation sheltered from the direct rays of the sun, but exposed on all sides to a free current of air. Dr. Moffat's method

requires a large box for the exclusion of light, but perforated at the bottom for the admission of air; the test paper is suspended within the box, and the register determined by the amount of brown discoloration in a given time.

In practice, Dr. Schönbein determines the register by a momentary immersion of the test paper in water, when the presence of ozone is indicated by an immediate purple discoloration, the intensity of which has determined by comparison with a scale of tints numbered from 1 to 10, gives the required observation. After the record is thus taken, the paper is valueless and may be thrown away. By Moffat's method, the paper, as discoloured by the action of ozone, if kept in the dark or between the leaves of a book, may be retained for years.

The want of accordance between observations at places near together is startling and unsatisfactory. At present the whole investigation is within the region of experiment. *Report read May 22, 1855.*

The Council wish to draw attention to the conclusions at which Mr. Glaisher has arrived respecting ozone.

For some time it was found that the want of accordance between observations at places near together was unsatisfactory, and therefore observations at many places were discontinued. During the cholera epedimic, however, it was thought desirable to resume them. The stations varied from an elevation of 10 to 400 feet, and were situated within the city, near the river, and beyond its influence both to the north and south of London. Test papers, as prepared by Drs. Moffat and Scönbein, were exposed in the morning and evening daily.

The general results deduced from these observations tended to shew that the amount of ozone at all stations of low elevation was insignificant, and at many places near the river quite inappreciable. On the other hand, it was found that, at places of high elevation, ozone was shown nearly at all times, and at other and intermediate stations occasionally. The presence and amount of ozone would, therefore, seem regulated by the elevation of the land, and to increase according to the ascent. On discussing the country observations, it was found that at all times the amount of ozone was the greatest at places of highest elevation and at stations near the sea. By separating them into two groups of inland and seaside stations, it was found that the amount of ozone at seaside stations at the same elevation was nearly four times greater than at the inland stations.

By comparing the results from the Metropolitan stations with those of the country, it was found, that in London there was generally a great deficiency. These results are so far accordant that the Council consider the subject to have advanced beyond the region of experiment, and express a hope that observations on ozone will be included by meteorological observers in the subjects of their research. The last papers, prepared by Dr. Moffat, were found to be more sensitive than those of Dr. Schönbein, and arrangements have been made by Dr. Moffat to supply Messrs. Negretti and Zambra, 11, Hatton Garden, with boxes of papers for sale prepared under his own superintendence.

To the Editor of the Sydney Magazine of Science and Art.

SIR—Whether it will pay the Australian farmer to use artificial manure or not, or whether it be wise to throw away natural manure, as animal excreta, straw, chaff, &c., however important, the inquiry is not my present purpose to discuss. But, seeing attention is called to bone manure, I am desirous, if the experiment be tried, that it should be upon rational principles, and that wrong conclusions, disappointment, and loss, may not be the result.

I would therefore call attention to the five following of Liebig's fifty propositions, and shall number and quote them verbatim, &c., as translated by Gregory:—

"15. Animal manure not only supplies the plants with a certain amount of their mineral and atmospheric food, but also provides them, in carbonic acid and ammoniacal salts, those substances which are the most indispensable for the introduction into the vegetable organism of the mineral constituents, which by themselves are insoluble in water, and this to a larger amount in the same time than could be effected without the co-operation of decaying organic matter.

"16. In warm dry seasons plants receive from the soil less water than they do in the same circumstance in wet seasons. The harvest in these different seasons is in proportion to this variable supply. A field of the same quality yields in dry years a smaller crop, which increases in more moist seasons, and if the average temperature be the same, it increases up to a certain limit with the amount of rain.

"20. All plants, without exception, require for nutrition phosphoric acid, sulphuric acid, the alkalies, lime, magnesia, and iron. Some important genera require silica.

In some genera the alkalies may be replaced by lime and magnesia, or these latter by the alkalies. All these substances are included in the term mineral food of plants. Carbonic acid and ammonia are the atmospheric food of vegetables. Water serves as a nutritive substance, and as a solvent is indispensable to the whole process of nutrition.

"21. The different substances necessary to the growth of a plant, or the different articles of their food, are all of equal value; that is to say, if one out of the whole number be absent, the plant will not thrive.

"41. If the absent or deficient [illegible] be added to the soil, or if present, but [illegible] be rendered soluble, the other [illegible] are thereby rendered efficient. By [illegible] or absence of one necessary [illegible] the others being present, the [illegible] for all those crops to the [illegible] constituent is indisp[illegible] rich crops if that sub[illegible] able form. In the [illegible] position, experim[illegible] enable us to acq[illegible] of the land [illegible] mineral [illegible] phate lime [illegible] is if it in[illegible]

of the others. Had any of these other necessary substances been also wanting, the phosphate of lime would have had no effect."

Page, 133; foot note:—"The produce of a field stands related to the amount of that mineral ingredient, which its soil contains in smallest quantity."

I regret having been obliged to sever these propositions from their natural connexion; still, I think they are sufficiently clear to shew the principle of manuring, and guide the practice.

There is one point to which I venture to call special attention, viz., the best form or condition to apply manures in this colony; and although this applies to all manures, I shall merely refer to bones.

It is beyond question that, other things being equal, an immediate, is preferable to a permanent effect. Hence, in England and other parts of Europe, composts containing bone or its equivalent, either as a soluble salt or held in solution by sulphuric acid, are preferred and answer well. But the sixteen propositions shew that the effect cannot be calculated on in any season, even with manure of the best quality and form. Does it follow, therefore, that bones [illegible]

sulphuric [illegible]
sons are [illegible]
were applied [illegible]
after the first [illegible]
and their [illegible]
cases the [illegible]
solid [illegible]
out of the [illegible]
other [illegible]
been and [illegible]
the [illegible]
manner [illegible]
more [illegible]
of [illegible]
moisture [illegible]
use of [illegible]
are
[illegible]
more [illegible]
[illegible]

OBSERVATORY, SYDNEY [illegible]

HEIGHT [illegible]

Day.	Barometer corrected to 32 deg. Fahrt.		Wind			
			Direction.		Force.	
	9 A.M.	9 P.M.	9 A.M.	3 P.M.	9 A.M.	3 P.M.
1	30·170	30·131	[illegible]	[illegible]	[illegible]	[illegible]
2	·115	·061	[illegible]	[illegible]	[illegible]	[illegible]
3	·071	29·993	[illegible]	[illegible]	[illegible]	[illegible]
4	29·899	·841	[illegible]	[illegible]	[illegible]	[illegible]
5	·841	·723	[illegible]	[illegible]	[illegible]	[illegible]
6	·671	·709	[illegible]	[illegible]	[illegible]	[illegible]
7	·880	·949	[illegible]	[illegible]	[illegible]	[illegible]
8	30·041	30·073	[illegible]	[illegible]	[illegible]	[illegible]
9	·190	·157	[illegible]	[illegible]	[illegible]	[illegible]
10	·070	29·971	[illegible]	[illegible]	[illegible]	[illegible]
11	29·990	·897	[illegible]	[illegible]	[illegible]	[illegible]
12	·869	·779	[illegible]	[illegible]	[illegible]	[illegible]
13	·777	·772	[illegible]	[illegible]	[illegible]	[illegible]
14	·769	·671	[illegible]	[illegible]	[illegible]	[illegible]
15	·653	·729	[illegible]	[illegible]	[illegible]	[illegible]
16	·836	·851	[illegible]	[illegible]	[illegible]	[illegible]
17	30·074	30·039	[illegible]	[illegible]	[illegible]	[illegible]
18	·132	·11	[illegible]	[illegible]	[illegible]	[illegible]
19	·093	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	·114	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	·[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	·[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

every

Registrar General's Office,
Sydney, 18th August, 1858.

HEALTH OF SYDNEY.

The number of deaths registered at the Central Office during the month of July is 112, viz.:—65 males and 47 females. The mortality of children under 5 years of age being exactly one half of the total deaths.

The number of Deaths registered during the corresponding month of last year was 106, and in 1856, 100.

The number of Births registered during July is 221, viz.:—108 males and 113 females, being 109 in excess of the Deaths.

TABLE SHEWING THE DEATHS OF MALES AND FEMALES REGISTERED IN EACH WARD, FROM 1st TO 31st JULY, 1858, DISTINGUISHING THOSE UNDER 5 YEARS.

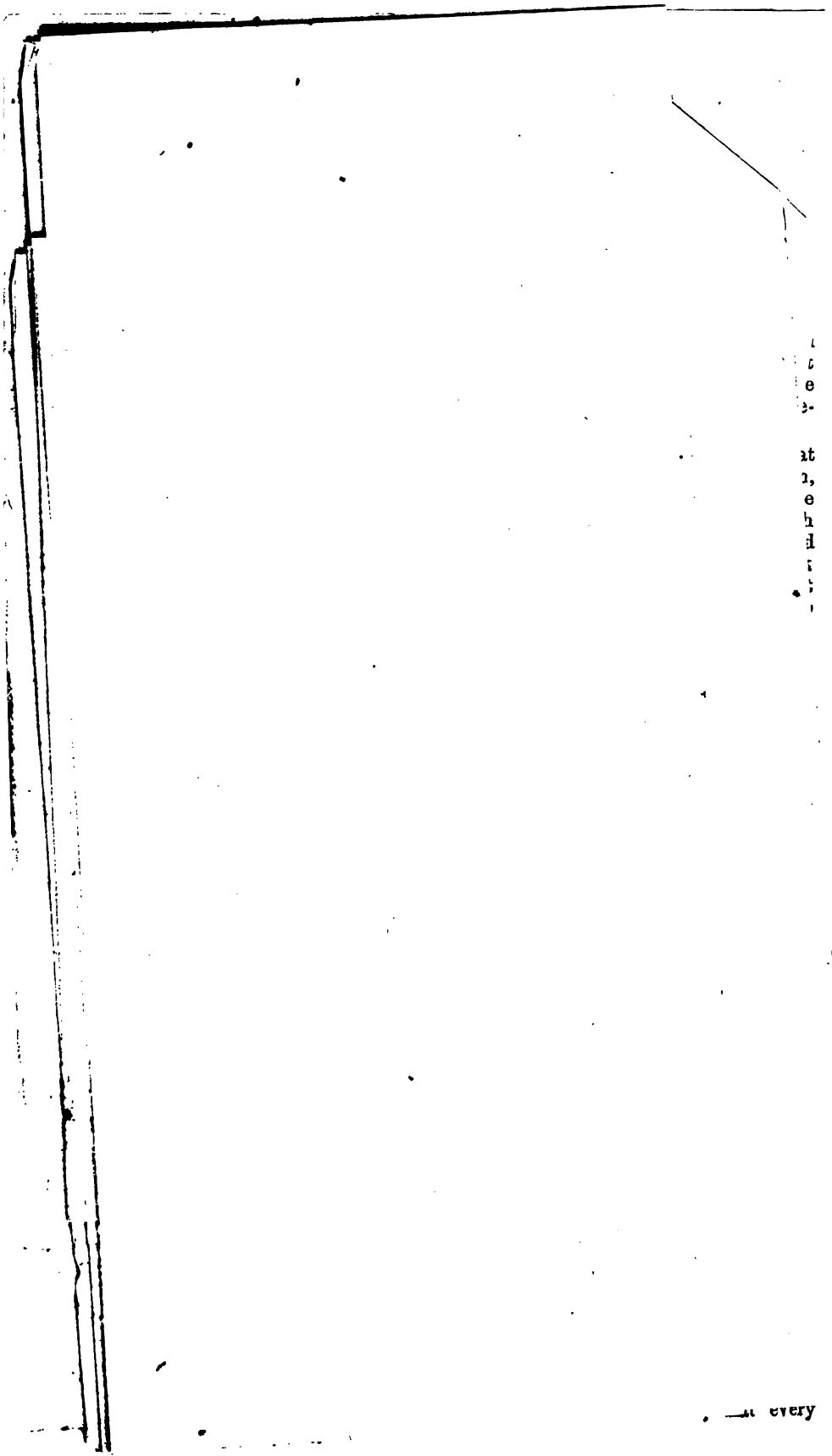
WARD.	UNDER 5 YEARS.			ABOVE 5 YEARS.			GRAND TOTAL.
	Males.	Females.	Total.	Males.	Females.	Total.	
1.—Gipps	5	4	9	6	4	10	19
2.—Bourke*	5	3	8	8	4	12	20
3.—Brisbane	1	1	2	1	1	2	4
4.—Macquarie	4	2	6	1	..	1	7
5.—Cook	3	5	8	3	1	4	12
6.—Fitz Roy	3	1	4	8	2	10	14
7.—Phillip†	5	4	9	3	6	9	18
8.—Denison	4	6	10	5	3	8	18
TOTAL	30	26	56	35	21	56	112

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1ST TO 31ST JULY, 1858.

CAUSES OF DEATH.	Under 1 Year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages.
ZYMOTIC DISEASES. Endemic, Epidemic, and Contagious	8	4	2	1	1	16	4	..	..	2	1	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	25
SPORADIC DISEASES. *Of Uncertain Seat.*—Dropsy and other Diseases of Variable Seat	6	..	1	..	..	7	..	..	..	..	..	..	1	..	1	1	..	1	..	1	..	..	..	..	..	..	12
Of Nervous System.—Diseases of the Brain, &c.	12	..	..	2	..	14	..	..	..	..	..	1	1	2	1	..	..	..	..	..	1	..	..	..	..	..	20
Of Respiratory System.—Diseases of the Lungs, &c.	5	..	..	2	1	8	..	..	1	..	2	1	2	1	1	..	3	..	..	1	1	..	..	..	..	..	21
Of Circulatory System.—Diseases of the Heart and Blood Vessels	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	1	..	1	..	..	..	..	..	..	..	4
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	3	5	3	..	..	11	..	..	..	1	1	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	15
Of Urinary Organs.—Diseases of the Kidneys, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Of Generative Organs	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1
Of Integumentary System.—Diseases of the Skin	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	2
Old Age	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	2	..	..	..	..	..	..	..	5
External Causes.—Violence, Privation, and Intemperance	..	..	..	..	..	..	..	..	..	..	1	1	..	3	..	1	..	..	..	..	..	..	..	..	..	..	6
Unspecified	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
DECEASE, Total, from all Causes	34	9	6	5	2	56	4	..	1	3	5	4	7	7	5	2	5	2	4	4	3	..	..	..	..	..	112

CHRIS. ROLLESTON, Registrar General.



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1.—Gipps ...
2.—Bourke*
3.—Brisbane
4.—Macquar
5.—Cook ...
6.—Fitz Roy
7.—Phillip†
8.—Denison

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SUMMARY

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A SCHOOL FOR MINERS.

It is quite time that we should recognize the fact that Australia must depend mainly for many years to come upon her mineral resources. Our population has now become too deeply imbued with the notion of acquiring sudden wealth to settle quietly down to either agricultural or manufacturing industry. The prevailing gold fever has plainly indicated the overpowering tendency of the public mind, and shewn that with the faintest prospect of success all other pursuits will be abandoned for the search for gold. It is useless to combat this feeling, the wise statesman would seek to direct it and aid by all the means in his power the views of the people he is appointed to govern by economising their labour and making equitable laws for all classes engaged in the pursuit.

The mineral wealth of Great Britain was the attraction that drew the polished Roman to its savage shores, and we know that even in an earlier than the Roman age it was visited for the same glittering prize by the ancient nations of the East whose traces are found in Cornwall. The gold of Mexico and Peru attracted the Spaniards there and antedated by hundreds of years the exploration of the continent of America. The same powerful causes are in operation now on the continent we inhabit. Within the past month thousands of Englishmen have traversed wilds that the white man never trod before, and are settled there with many of the luxuries of civilization.

It is painful to think how many hundreds of these have ventured on the inevitable hardships attending a miner's occupation, not only without the scanty experience afforded by a short life on the diggings in other parts of the colony, but without the least notion of where or how to commence their labours.

They will of course rely mainly on the experience of others and like a flock of sheep where one man "sets in" others will follow.

Considering the vast importance of this branch of labour to the colony it is wonderful that some effort has not been made to impart practical information upon it. No man presumes he can make a pair of shoes, or construct a house, or even square a stone without instruction, yet hundreds of individuals are found to throw down their ordinary implements of labour and seize a pick and shovel with the firm conviction that they can at once become successful miners. The few instances of success blind the unthinking to the multitudes of failures and cause them to despise experience.

The loss to individuals may not be much deplored, but the political economist must regard with dismay the immense loss to the state caused by such desultory and chance-directed labour.

Of the three thousand labourers that have left Sydney within the last month, it is fair to assume that two thousand have left remunerative employment by which they were enriching both themselves and the state. It is fair to assume we think that one half of these are entirely without experience of the labour they are about to undertake, and will be unsuccessful even supposing the gold fields of the North to be as prolific as the most sanguine imagine them to be.

Now the question arises whether gold digging or mining in general is such a hap-hazard game in the dark that the greenest novice stands as much chance as the scientific miner—no one will surely say that it is.

Has it not been proved over and over again, that the practical miner and geologist can point out spots in which gold may be sought with every certainty of success, and on the contrary, has pointed to other spots where it would be madness to expect it? Is it not found that quartz veins assume peculiar conditions, and that their wealth may be predicted from their position relatively to the strata in which they are found?

How few persons in this city, who may observe in traversing some parts of the remote interior, metallic traces in the soil could say that copper, silver, lead, or any other deposit was indicated? This condition of ignorance, delays to an incalculable degree the development of the resources of the colony, and is one which the Government, and indeed, every individual is interested in alleviating.

We do not imagine that it is possible to make each member of the population an expert geologist, but we do believe, that so large a number are interested in the search for mineral wealth, that every

opportunity of gaining such information would be eagerly seized.

We are sure, that hundreds of those, who have rushed off to Port Curtis, would have gladly attended a few short practical lectures on mining, illustrative of the indications that are to be looked for where gold exists, and contrary wise. They would have been immensely assisted by such instruction, and there are those in this colony eminently capable of imparting it.

It will be seen that, we attempt something of the sort in the present number of this journal, wherein we print at full length the valuable observation of Mr. H. A. Thompson, the manager of the Clunes Mines in Victoria. Those in this colony who are acquainted with or possessed of auriferous reefs of quartz will do well to study it with attention, while the observations on mining for gold generally will be found to prove what we have asserted, that it may be successfully pursued by the light of scientific experience.

Although we may startle some when we suggest, that the classical halls of our University should be invaded by intending diggers, yet we do most strongly urge on the Government, the consideration of appointing without delay, with an ample salary, a professor of geology and mineralogy; also, the immediate establishment of a school of mines, with a practical mining engineer at its head, and a museum of mineralogical specimens and mining implements, with plans of mines, for the instruction of those of our population who are so plainly demonstrating how much such information is wanted. We are quite tired of accumulating instances in which New South Wales is surpassed by Victoria, but this affords too tempting an opportunity. We only say that Melbourne has such a Museum!

A TREATISE ON SHEEP BREEDING AND WOOL GROWING IN THE AUSTRALIAN COLONIES.

By T. S.

I think all people who have paid much attention to the rise and progress of the Australian Colonies, must acknowledge, that Wool, has been from the beginning, and still remains, the most important branch of their business, and to all appearance must so remain for a long time to come. It is in fact their staple trade. Wool first brought them into notice, and gradually established their character, as one of the most important of all the English Colonies.

This has increased to such an extent, that Australian Wools are now essential to the prosperity of the English Woollen Manufactory, and are becoming equally so, to that of other nations. Yet strange to say, Sheep Breeding is the most neglected subject in the Colonies.

Most other matters connected with the produce of the colony have claimed public attention. Men of science and experience meet, hold discussions, write letters, publish pamphlets, and endeavour by various means to make the sciences of the subject understood, and render those interested alive to the benefits to be derived by bringing it into practise.

But on the head of Sheep breeding, we have nothing of the kind. This is much to be regretted.

There are few occupations that require more practical knowledge, than the Breeding of Sheep; few in which greater mistakes can be made; few, if any, less generally understood; and none capable of greater improvements. But it requires men of practical experience to take the matter in hand, to endeavour by every means to correct the numerous existing errors, and bring the business to something like a systematic practice.

It is thought, there never was any country in the world where a business was so extensively followed, with so little knowledge of the art. Indeed there might be no art or science in the matter, but there is no business when more art is required, which must be practised to excel.

Although there have been great and numerous errors committed in breeding from the commencement up to the present time, still the Wools of these Colonies have risen to great estimation—this speaks volumns for the richness of the climate. If all this has been effected under such bad management, it is hard to say what results might not have been attained with scientific breeding. Much has been done, much more might have been done, but still more remains to be done. There may be many men in these Colonies better qualified than I, to speak on this subject, who are quite ready to come forward if the ice is once broken. With a view to so break the ice, and call from their hiding places, men of experience, to give us instructions and directions, I write this article on a subject, of all others, in successful Sheep breeding, the most necessary to be well acquainted with, for very important reasons.

Yet it is a subject, the least of others understood in these Colonies, and in many cases not thought of or cared for, namely climate and its effects.

Climate is an all powerful agent, not to be resisted, it may be opposed, but never beaten; it forms the soil, and the herbage, stamps everything brought within its range, with its own peculiar character, and in nothing is this more the case than in Sheep.

Sheep are animals so constituted as to endure all climes, from Indus to the Pole—yet, in every country where they are to be found, the climate communicates to the Wool, a character peculiar to itself, and distinct from all others. So great is this difference, that it is very easy to tell, by observation of the Wool alone, it what part of the world it was grown. It is essential that every Sheep Breeder should know this, and especially the character of his own climate, for reasons which shall be shewn.

In order to illustrate this fact, let us take four of the leading Wool-growing countries, shew the character of each, and in what particular points they vary, viz.:—England, Spain, Germany, and Australia.

The value of all Wool depends upon its man-

ufacturing qualities. These are soundness, denseness, freeness, fullness, softness, a fair length of staple and good milling or fulling properties—all Wools with these qualities are valuable, the more so according to their degree of firmness.

By soundness, is meant the staple sound and strong.

By denseness, the fibres in the staple very close and compact, not hollow or open.

By freeness, these fibres although very dense, not intermingled or combined one with the other—but so that they separate as freely as the threads of a skein of silk.

Fullness, these sound, dense, free, staples closely planted yet not intermingled or combined one with the other, but separate as freely as the leaves of a book, shewing the skin clearly at the bottom, yet small as a pencil line.

Softness needs no explanation except that it is a very important quality—Wool possessing all the above without softness, is hard and harsh in the whole process of manufactory—and when completed the goods produced might be firm and substantial, but not rich and smart, on the contrary rough and hard to the touch and unpleasant to the eye.

Softness gives pliability and added to the above qualities the Wool works kindly, improving in every process, and when finished the goods are rich and ornamental, as well as substantial.

Fulling or strong propensity to combine in the milling operation, so as to make a firm compact body of cloth, not slack or flannely, but substantial like fine dressed leather.

Add to the above qualities a superior degree of fineness and we have a perfect Wool, the value of which is depreciated, according to the extent of any defect in any of these qualities.

England grows coarse Wool to great perfection, there are no coarse Wools in the world equal to the English in quality, the staple is long and sound, the fibres free, it mills well, but still it is so far inferior to the Australian in fineness, as not to come into competition with it.

The two Wools are used for entirely different description of goods. The English not being adapted for the purposes for which the Australian are used, and *vice-versa*.

The manufactory of these Wools, comprises two distinct branches of the art, carried on by different machinery, and made into different descriptions of goods for different purposes.

In England they still use the terms clothing and combing, yet very little English Wool is made into cloth, these are ancient terms still kept up, although what is called clothing, is chiefly used for flannels, blankets, druggets, serges, and various coarse goods of this description, for which this Wool is the best adapted of all others.

But a large proportion of the English Wools are used for the coarse and heavy description of Stuff or Worsted Goods—Coarse Merinoes, Bombazines, and goods of this description. From the excellent qualities it possesses for these manufactures it derives its value, and its superiority to all other coarse Wools. But the climate of England precludes the perfect growth of fine Wool. For instance, introduce into England the finest Merino Sheep and their Wool speedily loses its rich quality of fineness, it becomes hard and harsh, and gradually coarse. The first fleece will be affected, and each succeeding fleece more so.

Make no cross, but keep them pure, the first generation will be coarser, harder, and opener than their parents and so on with each succeeding generation, till they become a brand without character of either fine or coarse Wool, and not possessing the qualities of either, and therefore not so valuable. This is no theory, Lord Western has devoted a number of years, and expended a large amount of money, and tried every experiment to grow fine Wool—or rear a breed of Sheep superior to the English, from pure Merinoes—and has made every kind of cross with the various breeds of English Sheep. What is the result—the production of a bastard breed of Sheep without character. He has been fighting against climate and has been beaten.

Spanish Wool is a great deal finer than English—so much so, that, formerly, all the fine description of cloth used in England, was made from Spanish Wool. The demand was such, that I have known this Wool sold for ten shillings a pound in England. It was the best clothing Wool then known, it milled well, made a firm, substantial, and what was then considered fine cloth, yet it was greatly difficient in softness, consequently not rich and ornamental. When the Spanish Sheep were introduced into Germany, it was found, that under the influence of that climate, the Wool not only retained its original fineness—but greatly improved in softness. This fact being ascertained the Germans saw their advantage, and like a wise people earnestly set to work to profit by it; some of the Princes, I forget which taking the lead—they called meetings, published works, and established schools in order to bring about a scientific system of breeding Sheep. The result is well known. They produced Wool so far superior to the Spanish, not so much in fineness as in softness, as to supersede it for the purposes of fine dressed cloth; thus placing the Spanish Wool in a middle position, superior to the English, but far inferior to the German. Under the German climate and management, the Wool also improved much in length and soundness of staple, and freeness of fibre. This induced the firm of Addison and Roper of Bradford, Yorkshire, to try if it would stand the operation of combing, the experiment succeeded, and a new description of worsted goods was produced, so light, soft, fine, and rich, as to compete with silks and satins for ladies dresses, the best description being thought richer and more valuable. This business was soon taken up by other firms Messrs. Garnett—then Mr. Wood—and so on until it has become a very extensive business, still on the increase. The Germans, wrought with climate and succeeded. But notwithstanding all, there is a great defect in the German climate, which shews itself in the Wool, this is the milling quality in which it is greatly deficient; it never made so firm and substantial a cloth as the Spanish, it is too light, slack and flannely—more suited for ornamental purposes, while the Spanish is more adapted for use, wear and tear. The climate of the Australian Colonies is as much superior to that of all others for the growth of fine Wool (possessing every manufacturing quality) as that of England for the production of coarse Wool. It gives the milling quality equal to Spain, and the softness equal to Germany. The Wool grown by sheep properly acclimatized and which have become truly Australian in character, posesses the good qualities of Wool grown in both these countries, without the defects of either. It makes cloth as substantial and useful as the Spanish, and as rich and ornamental as the Saxon. This is a great advantage, but the Australian Combing Wool is the most valuable in the world. Although fine stuff goods were *first* made from German Wool, the Australian Combing Wool has been proved so far superior, that could a sufficient quantity be obtained to suit the requirements of the trade—not a single pound of German would

be used for this purpose. But the quality essential for combing purposes must be bred for.

It has here been shewn what influence, climate unaided, has upon some qualities of Wool, and also the necessity of producing other qualities by artificial means. It is the nature of the Australian climate to produce fine Wool to great perfection, communicating a superior degree of the milling quality and softness. Length and soundness of staple, fullness and freeness of fibre, an essential in combing Wool, this we must breed for. Now I think the subject is fairly laid open for discussion—If I am wrong in any of the above remarks, I shall be most happy to be corrected—If right, the absurdity of a continual importation of foreign sheep is sufficiently apparent. The climate of this country is superior to that of all others. Wool grown by sheep judiciously bred under its influence, possesses all the essential qualities in a far superior degree to all other Wools. What good can be obtained from foreign Sheep I cannot perceive, but the evil effects which they produce, is in my mind beyond question. If we introduce German Sheep, we injure the milling quality—if Spanish we destroy softness, it will take at least two or three generations to redeem these qualities—if the sheep imported are English, we destroy all these qualities at once—and the only redemption is the butcher. It is like engrafting a crab to improve the flavor of the apple, a Ribston-pippin for instance.

We hear a great deal said in these parts, about breeding *in and in*,—every defect is attributed to this, I think upon close investigation, it would be found that the evil lies in breeding *out and out*. There may have been cases where family blood has not been sufficiently removed, but the great bulk of the mischief done and the cause of the numerous defects in the flocks, is, bad selections, the importation of Sheep not suited to the colony, and injudicious crosses. I should very much like to know, what is meant by the two terms—*cross* and *fresh blood*. I shall be very much obliged if some of our good friends will enlighten me on this subject.

PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

August 11th.—Twentieth Monthly Meeting of the Philosophical Society of New South Wales, held in the Sydney Chamber of Commerce. His Excellency Sir W. T. Denison, K.C.B., in the Chair.

The Minutes of the last meeting were read and confirmed.

James Robey, Esq., was duly elected an ordinary member.

One new candidate was proposed and seconded.

The Rev. William Scott read a paper "the Meteorology of New South Wales," No. 2, and presented to the Society, the Parramatta Meteorological Tables, from June 1857 to July 1858 ; also, Meteorological Results for New South Wales in Monthly Abstracts, from June 1857, to June 1858, together with a Pamphlet entitled "Instructions for Meteorological Observations in the colony of New South Wales.

Captain Ward then read a paper illustrated by diagrams, from H. A. Thompson, Esq., Mining Engineer, Victoria, on "the Clunes Mines" and laid the following papers on the table, from the same gentleman, "Gold Deposits of Victoria," "Outline of plan for the formation and working of a Mining Company to open out the Quartz Fields of New South Wales."

Christopher Rolleston, Esq., read a paper "on Sydney Mortality, from the 1st March 1857, to 28th February 1858."

The President announced that Dr. McDonald's paper "on the Anatomy and Relationships of the Hydroid Polyps was postponed.

Moved by Mr. Dyer, seconded by Mr. Aaron—That a sum not exceeding one hundred pounds (£100) be appropriated from the funds of the Society as a reward for the best Essay on the mode to be adopted for forming the streets of Sydney, the essay to be accompanied by plans and estimates of expense, approved by a board of professional gentlemen appointed for the purpose.

The motion having been put to the meeting from the chair, was negatived.

The President laid upon the table for the inspection of the members, a small portion of the Cable of the Atlantic Telegraph, with two sections, one from the middle of the Cable, the other from the shore end.

Mr. Norrie exhibited Davis's Magneto—Electric Machine.

Meeting adjourned until Wednesday, the 8th of September.

September 8th.—Twenty-first Monthly Meeting of the Philosophical Society of New South Wales, held in the Sydney Chamber of Commerce. His Excellency Sir W. T. Denison, K.C.B., in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. W. B. Allen was duly elected an ordinary member.

Two new candidates were proposed and seconded.

The following Papers were then read :—

"On the Present State of the Supply

of the Ores of Mercury," by the Rev. W. B. Clarke, M.A.

"On the Filtration of Water Through Sand," by His Excellency Sir W. T. Denison, K.C.B.

Meeting adjourned until October 13th.

ON THE FILTRATION OF WATER THROUGH SAND.

By Sir William Denison.

The City of Sydney has been for many years dependent for its supply of water upon the drainage from the upper portion of the valley which opens into Botany Bay, at the site of the Water Works now in course of erection. The whole area of this valley is about 5000 acres, but that of the portion which has hitherto supplied the town does not exceed 600 acres. This portion is called the Lachlan Swamp —it is a basin filled with sand, having hills on three sides, the natural outlet has been dammed up by the Randwick Road and other embankments, while a tunnel has been cut through the western range of hills by which the water dammed into this basin is enabled to make its way into the city; from the upper end of this tunnel a ditch has been cut, extending across the swamp, into which the water drains and is carried off to the town. In dry seasons it has been found necessary to extend this ditch, and to cut branches connecting it with different parts of the swamp in order to allow the water to drain off more rapidly towards the tunnel. This was done last year, and an inspection of the work, while in progress, led me to institute a set of experiments, the results of which I propose to bring before the Society.

It has been long known that soil is in some respects analagous to a sponge, that it retains the water which falls upon it partly by a sort of capillary attraction, partly by its mechanical resistance to the passage of the water among the particles composing its mass. This resistance is, of course, much greater in some classes of soils than in others. In a stiff clay, for instance, it has been found that to produce efficient drainage a fall of not less than one in twelve must be allowed in order to insure a rapid percolation of the water through the soil to the drain. In Chat Moss, over which the Liverpool and Manchester Railway was carried, the surface of the spongy moss rose and fell according as the season was wet or dry, but was at all times above the surface of the surrounding soil—at times, I believe, to the extent of 30 feet. My object in instituting the experiments, the results of which are shown in the drawing before you, was to ascertain the measure of the resistance of the loose sand of the Lachlan Swamp (and by analogy of the whole of the sand between Sydney and Botany Bay) to the transmission of water; for this purpose, I required Mr. E. Bell, the City Engineer, to cause sets of levels to be taken carefully from the surface water in the outlet drain to the right and left in several places, and to mark the difference in the height at which the water stood in the basin at varying distances from the outlet. The following abstract, which will be verified by an inspection of the section, will show the results of the experiment:—

The first hole was made at 171 feet from the drain, the water stood there 49·33 feet above the datum line on February 14th.

The next hole was 200 feet from the first, and the water stood in 47·57 feet above the datum or 1·76 feet lower than in the first, the slope therefore was 1 in 114.

The third hole was 200 feet from the second, and the water stood in it 42·17 feet above the datum, or 1·75 below that in the last hole, and the fall was the same or 1 in 114.

The fourth hole was again 200 feet from the third, and the difference of level being 1·70 feet the fall of the surface was 1 in 115.

These slopes varied according to the state of the weather, those above datum exhibited the result during dry weather, when the water had had time to draw itself off more completely. The ground becoming more saturated the surface of the water approached more nearly to a level, as shown in the following table:—

Slope in dry weather.	Slope in wet weather.
1 in 114	1 in 122
1 in 114	1 in 122
1 in 115	1 in 122

I attribute the apparent change in the fall between No. 2 and 3 to some slight error in the level between the 1st and 2nd;

the 2nd and 3rd and the 3rd and 4th holes appear to be very regular and uniform, with the single exception before noted, and within the limits shewn, the table marking the difference due to dry and wet seasons may be taken as indicating the limit beyond which a sandy basin similar to the Lachlan swamp can be depended upon as a means of supplying the demands for water.

Experience has shewn that in rainy weather the mass of the swamp is thoroughly saturated with water, which rises above the surface in all the lower parts; while this is the case the water flows rapidly through the tunnel and the supply is ample. As soon, however, as the surface of water is brought below that of the ground the rapidity of the flow into the drain is diminished by the friction or resistance of the sand the supply falls short, and recourse is necessarily had to the pump at the lower end of the basin. As more and more water is drained away it becomes necessary to dig fresh ditches, in order to drain more rapidly the portions of the swamp to the right and left of these, a process which is expensive, as owing to the nature of the soil, which is a running sand, these ditches fill in almost as rapidly as they are made.

It would seem then that in calculating the quantity of water which can be extracted from any sand basin, similar to that of the Lachlan Swamp, an allowance must be made for the slope which will be necessary to force the water through the sand to the outfall of at least 1 in 115; so that in a basin of say 1150 feet in diameter, filled to the height of 5 feet above the outlet, not more than one half of the water which it contains can be depended upon for the supply of a town, the remainder will be retained as in a sponge.

Were the inhabitants of Sydney compelled to rely upon the Lachlan Swamp for a supply of water, immediate steps would have to be taken to retain the whole of the water which falls into the basin at as high a level as possible. Luckily, however, the arrangements now in progress will place a sufficient supply at the disposal of the citizens, sufficient for all their wants for many years to come. As, however, the area of the drainage is limited and the supplies variable, as being dependent upon the fall of rain, it will probably, after a time, be found necessary to seek for means of extending the area of drainage by turning the existing outlets into that now about to be occupied by the Water Works. In any work of this kind, however, it will be necessary to bear in mind the facts now laid before the Society, that a fall of at least 1 in 115 must be secured when dependence is placed upon the drainage of rain through even loose sand; and that the more coherent the soil the greater must be the fall allowed to bring the water to the outlet.

W. DENISON.

GOLD DEPOSITS OF VICTORIA.

Geological Character.—The gold producing rocks of this colony may be divided into three classes, viz.:—Granite, New Schists, and Old Schists.

1st. The schore granite is undoubtedly in some cases an auriferous rock, and on the Ovens gold field has yielded a large amount of fine flaky gold, which is principally found in the decomposed surface of the granite, along with the peroxide of tin—the stream tin of miners. It appears to have been aggregated into particles of gold, visible to the naked eye, as its constituents were liberated by the decomposition of the enclosing rock.

2nd. The later schist rocks of Anderson's Creek, and the Caledonia Diggings* (similar to those under Melbourne), which are of sedimentary origin, and have little or no trace of cleavage. These are not very productive in alluvial gold, and the auriferous quartz veins traversing them are thin; but from crossing the beds at a favourable angle, they frequently yield small quantities of rich quartz.

3rd. The primary or old schist rocks, forming the gold fields, situate on each side of the dividing range to the north and south, and between the Goulburn and the Grampians in an east and west direction, with the above-named exceptions.

The old schists consist of alternate bands of slate and sandstone—on edge—running in a meridional direction, and strongly marked by vertical cleavage planes having the same strike. These planes are usually supposed to be formed by the action of magnetic currents, and an idea of their appearance may be attained by placing a closed book on its back, with the edges of the leaves uppermost, when the spaces between the leaves will represent the cleavage planes.† A number of books placed side by side in the same position would indicate the alternate bands of sandstone and slate.

Quartz Veins.—Most of the quartz veins traversing these rocks run in the same direction with the cleavage planes, and are continuous for many miles in extent. The series of veins forming the Ballaarat field may be traced for twenty miles, and then dip under the trap to the north and south. They are a description of vein so irregular and uncertain in form, and so unfavourable to the collection of minerals as to be con-

* Caledonia Diggings.—The Waranga gold fields may belong to this class.

† Cleavage Planes.—Calling these planes "the grain of the rock" may give a better idea of their true character and functions.

sidered by the miner entirely worthless. It is this character which has led so many parties to predict the failure of all attempts to make quartz mining profitable, but they have overlooked the fact that the great value of gold renders a small per centage payable as compared with other metals. Davies's Reef, at Steiglitz, is the only instance I have yet seen of a true but weak lode, crossing the cleavage planes both in direction and dip, and its productiveness is well known.

Similar true veins are not likely frequently to be met with in these rocks, but should a strong regular vein, crossing the auriferous bands of schist at a favourable angle, ever be discovered, its value would be incalculable. Many theories have been promulgated to account for the deposit of gold in the quartz veins, but seeing that the attending phenomena are precisely the same as accompany the aggregation of other metals in veins; and that nature has never yet been found to work by two laws, where one would effect the desired object, we may safely conclude, that the gold or its constituents has been drawn from the bounding rocks, and aggregated in the veins (probably by means of the magnetic currents), in the same way as other metalliferous deposits have been formed.

Formation of Alluvial Gold Deposits.—The great amount of denudation sustained by the surface of the country is shewn in numerous instances, such as the existence of the numerous worn beds of torrents, where at present there is not sufficient water, even in winter, to form a channel; and of valleys from 50 to 200 feet in depth, which have been grooved out of the solid rock, in the comparatively recent period since the trap was effused. In this wearing down of the surface, the gold aggregated in the rocks and veins has been liberated, and is now found occasionally on the sides of the hills, forming what is termed surfacing, but mainly in the valleys, mixed with the sands, clays, and gravel brought down by the floods. This alluvial gold deposit is of two kinds, distinct in character, and pointing to two epochs of deposition.

The 1st deposit has been formed on the ancient valleys and plains, and these having subsequently been re-channelled by the action of water, now present the appearance of round-topped hills and spurs on the sides of the existing vallies, nearly of the same height, and capped with a deposit of white and red clays, sand, and gravel. This alluvium has generally proved rich in gold, large accumulations being found resting near the bed rock; but the distinguishing characteristics are—

1st. The debris throughout being more or less auriferous, producing from a quarter dwt. to 10 dwts. per ton.

2nd. The quartz and other pebbles being so much water worn, it is difficult to find an angular stone among them.

The 2nd deposit is met with in the present vallies, which are evidently grooved out of the older vallies or plains. Here the gold rests on the rock, or on a pipeclay bed immediately above the rock. The alluvium is composed of yellow clays, sands, and gravel; the white clay always resting on the rock, small in quantity, and apparently originating in the decomposition of the surface of the slate. It may be distinguished by

1st. The debris being, with few exceptions, destitute of gold except on the bottom.

2nd. Many of the pebbles being angular, and comparatively little water worn.

What may have been the conditions attending the deposition of the old drift is a subject for conjecture, but the 2nd deposit has evidently been formed by the long continued action of running water on the ancient vallies, where the streams gradually changing their course from side to side have washed and rewashed the alluvial drift, until all the gold it contained has fallen on the rocky bottom, and from its nearly imperishable nature remained little altered to the present time.*

Trap Rock.—The most casual observer must have noticed the great area of country, amounting to some thousands of square miles, which has been buried under the volcanic rock, variously named —trap, basalt, bluestone, or ancient lava. This rock has inundated a large proportion of the schistose districts, filling up the lower vallies, and forming extensive plains and table lands, from which the tops of the old ranges may be seen projecting in many places, like islands from the sea. The effusion has occurred at a comparatively recent period, viz., since the formation of the 1st alluvial gold deposit which it overlays in many places. For instance, the old valleys (*i. e.* the deep sinkings) of Ballaarat all pass under the trap, while the corresponding modern vallies are 200 feet above them; but on the Loddon, the hill sinkings through the same rock have struck the old drift under it, and raised a large amount of gold from the old river beds, 100 feet above the present streams, a difference caused in the latter case by the beds of trap being thin, and the denudation so great as to groove out new vallies, cutting through the trap, old drift, and deep into the schist rock.

The disturbing forces have been so active on each side of the dividing range that the gold fields situate on this line, may be said to be bounded by the trap rocks under which they dip; and, at a moderate computation, there must be three miles of alluvial gold country so buried for every mile now exposed.

Mining for Gold.—In the early days of gold digging each man was allowed an area of from 8 to 12 feet square, but lest they should attempt to combine in large bodies, and work the ground on a cheaper and more efficient system, every party was carefully precluded by the regulations from holding more than four claims, and it was also a condition that the shaft must be sunk in the middle of the claim. As a natural consequence, the surface was covered with a number of separate shafts, and, in the first instance, partially worked; next season another set of shafts were sunk, and another portion of the gold taken out; and so on until the ground was so shaken, as to render the extraction of the gold unprofitable, although much of it was still left. This system was rigidly adhered to until the gradual impoverishment of the old fields compelled some modifications, but these have been conceded grudgingly, and with such restrictions as to render them nearly inoperative.†

The only cause I have heard assigned for this suicidal policy was the necessity of preventing the gold fields being monopolised by foreign capitalists; but, unfortunately, in endeavouring

* Present time.—In some places the two deposits are mixed, and in others the 2nd deposit is absent on account of the old alluvium having been protected from wear by a layer of trap, or other peculiarities.

† Inoperative.—Amalgamation of claims has been allowed of late, but only on obtaining the sanction of the local Courts, although it is difficult to see what benefit can arise from this restriction. The regulations are yet so framed on some fields, as to exclude hired labour in working the claims—thus practically securing the ground to the men who have both capital and labour in their own persons; the men of capital, without labour—or the labourer, without capital—are excluded, by not allowing them to combine, and supply their respective wants.

to exclude this phantom, they excluded the digger capitalist as well. The majority of the diggers either worked for a bare living, or when they made a lucky hit, spent the proceeds in riot and debauchery; but still a goodly number saved sums of from £500 to £3000, gained by steady work and good judgment, combined with the self-denial and prudence more especially necessary to resist the effects of such sudden acquisition of fortune. As a body, these were generally large-brained thoughtful men, holding the same mental position in regard to their order as the successful merchant or professional man does to the middle classes of society. When no facilities were afforded for the profitable outlay in extended mining operations, of the capital thus accumulated, and the increase of population on the gold fields, combined with their impoverishment, gradually reduced the earnings of the diggers,—many of those who had saved sufficient to make them rich men in their station, were tired out and returned home with their money, leaving the men of mere thews and sinews behind. I consider the non-retention of this class in the colony as one of the greatest evils resulting from the gold regulations, intended to place every man on an equality; it was not, however, an equality that gave every man a chance of rising, but one tending to pull all down to the same level.

It is hardly necessary to dwell on the waste of gold and labour consequent on this rude system; the former can only be guessed at, but at least three-fourths of the latter has been expended needlessly, and with an inefficient result.

The strong prejudice formerly existing against more liberal grants for mining purposes, and the employment of hired labour in working them, has been compelled to recede before the decreasing yield per man, and the fact that there are thousands of men on every large gold field, anxious to exchange their poor and uncertain earnings for steady wages. Advantage might be taken of this to lease blocks of partially worked or watered ground, either to cost-book or co-operative companies, or to individuals desirous of working them with hired labour. There could be no monopoly in doing so if the number of men to be employed were the same as the number of claims in the block; and beyond this, and providing for the efficient working of the ground so leased, the fewer restrictions placed on the lessees the better.

Permanent Mining System.—Many of the older alluvial gold fields are becoming gradually exhausted, and although there is a considerable extent of untouched auriferous country in which new fields will be discovered that may keep up the returns of gold for many years, yet in time these also must fail. There are, however, two descriptions of mining likely to be more permanent, one of which has been imperfectly developed, and the other scarcely touched,—I mean quartz mining, and that of the alluvial gold fields buried under the trap.

Quartz mining, as at present carried on by small parties of men holding a limited area of ground, is a still more wasteful operation than the system applied to alluvial digging. The cost of sinking so many needless shafts is more, the method of working and removing quartz is attended with a greater waste of labour, and a large amount of the less productive quartz that would pay for removal with a better plan of working is left behind, and, in most instances, utterly lost to the country—as the inevitable cost of reworking and timbering the broken ground, will be greater than the value of the gold left in it. In many parts the auriferous quartz veins are too poor to pay, except they are worked on a large scale; in others the want of water is the obstacle, and none can be found willing to expend their capital in making reservoirs for other people; while some veins are heavily watered, and require expensive machinery to render the working of them profitable.

Seeing that mining for gold in veins must be carried on in the same way as mining for other metals, there can be little doubt that the system best calculated to develope their riches, is that followed in all other mining countries, viz., liberal grants of land, varying in extent according to the difficulties to be overcome, for the purpose of enabling lessees to expend capital with something more than a bare prospect of remuneration if the ground turns out well; for it should be remembered that the mining adventurer can only calculate on a certain per centage of his trials being successful, and these must pay for all.

The same principles will apply to mining on the alluvial gold fields buried under the volcanic rock. The ancient valleys and lower grounds are covered up, leaving here and there the top of a schist hill, or the crest of a range, projecting from the trap plains, to indicate the original form of the country and afford the means of guessing at the position of the old vallies. The cost and risk attending such mining operations must be so great that it is evident they could only be undertaken by companies possessed of considerable capital, having grants of large areas to prospect in the first instance, and the option of selecting a liberal area of ground for lease when they had discovered the leads. Without this they must remain unworked.

To granting leases for mining purposes, there are two important matters for consideration, viz.:—

To provide that the ground leased is worked on an efficient system, so as to ensure as nearly as is practicable the extraction of all the gold, and

To ensure a fair remuneration to the State for the use of the land and the right to mine.

For this purpose I would suggest—

1st. The establishment of a Mining Board or other authority in Melbourne, to whom the application for leases would be referred, and who would have a general control over this department of mining. It would not do to place this power in the hands of the local Mining Boards, as they are too much imbued with the prejudices of the small* but active and noisy party who support them, to be entrusted with it, as has been already shewn by the conduct of the same men in the local courts. There would be too many friends and relations of members to be conciliated, and too much of narrow-minded and class views to combat in the more strictly honest. These drawbacks would effectually stop the working of an improved system.

2nd. The appointment of Special Wardens to attend to this branch of mining, whose duty it would be to receive all applications for leases, examine the ground applied for, and transmit the application accompanied by their own report to the Board in Melbourne. Also to inspect the mines and accounts of the companies in operation from time to time, and see that the conditions of the leases were complied with, and to transact all other business connected with the leased mines. These Wardens should be carefully selected, and be gentlemen holding the same social standing as those now in office; but, in addition, they ought to be professional men, practically acquainted with mining operations—as similar officers in

* Small.—Compare the number who voted in the election of members for the Mining Boards with the number of miners on each field.

England. As the application for leases would not be many in the first instance, a few officers could attend to the whole colony, and might at first fill up their time by performing the common duties of the wardens, which they would be at least as well qualified to attend to as those now employed who have had to acquire all the professional knowledge they possess since their appointment.

The department might be managed by the present Wardens* with inferior officers (of the class of mining captains) under them, to act as dry nurses, and supply the information necessary for compiling their reports; but this would entrust an interest in which nearly all the gold mining of the colony must eventually be merged, to an inferior class of men; and seeing that the system has not met with much success in other affairs, I could not recommend it.

The term of lease might be for 7, 14, or 21 years, at the option of the lessees, who should have power to throw it up at any time on giving one month's notice in writing to the Warden.

Every application for a lease should be accompanied by—

A plan and description of the ground applied for, and the proposed method of working it.

A statement of the kind and power of machinery to be erected.

The minimum number of men to be employed.

The time required after the granting of the lease before commencing the works, and also the time to be allowed, or the work to be done, before the full complement of the men are put upon the ground.

The constitution of the company, and the proposed distribution of the shares.

If the application is granted these conditions should be embodied in, or appended to the lease, and any deviation from them, without the written consent of the Warden, should entail the forfeiture of the ground. It may sometimes be found advisable to change the plan of working, and the Warden should have the power of authorising this. In trifling alterations he might act on his own responsibility, but in important matters he would report to the Board, and abide their decision.

The lease should be simple in form, including the proposed conditions, and reserving the right of entry and examination of the works, account books, and plans, at all seasonable times, to the Warden or any party he may appoint to inspect the same; and should also require that proper mining plans and sections of the works be kept by the lessees, and filled up from week to week, and copies of these on a scale to be fixed by the Warden must be deposited with him once in every three months, to form a series of mining records.

The above requirements may appear strict, but in reality they will be found so by mere speculators only, for the prudent miner always enters on minute calculations of this kind before expending his capital; and I think they would assist in deterring too sanguine men from commencing rash speculations without the means of carrying them out, and be some safeguard against the formation of bubble companies, without hampering the legitimate miner.

In small companies the rental might be a fixed one, bearing the same proportion to the area leased, as the sum paid by the individual miner would do to a claim on the same ground; but in large companies, with a responsible manager, I would decidedly recommend a 5 per cent. Royalty—a method of paying rent answering so well that it has become nearly universal in all mining countries. Objections have been made to a Royalty on account of difficulty in collection and the risk of fraud, but I think both these have been much exaggerated. The manager of a mine should be made personally responsible, and any falsification of the returns, or use of the gold otherwise than is provided for in the lease, should be made felony, and entail forfeiture of the lease. No man would then be likely to risk his reputation and liberty for the benefit of a company; and besides fraudulent proceedings could not be carried on without the knowledge of the under officers, when all discipline would be at an end, and the company would lose much more than they could gain in this way.

To facilitate the collection of the Royalty copies of the weekly returns of each mine must be forwarded to the Warden, and the gold consigned to a bank for melting, assay, and sale at the current rates. The Royalty might thus be paid by the bankers, and the balance passed to the credit of the mining company, much in the same way as is done in the Clunes Mine.

The amount of Royalty obtained from these leased lands may not be more than will at first pay the expenses of the department; but as the number of companies increased, so would the returns, and eventually the State would derive a large and most legitimate revenue from this source.

H. A. THOMPSON.

* Wardens.—Many of the Wardens have performed their duties in a manner highly creditable to them, considering their utter ignorance of mining; at the same time there can be little doubt that with even a sprinkling of professional miners amongst them the gold fields, and regulations would not have been in the state they now are.

Outline of Plan for the Formation and Working of a Mining Company to Open out the Quartz Fields of New South Wales.

The number of Shareholders should be limited,—say not exceeding 20 persons,—as small companies work with more energy and consequent success than large bodies do. The Capital might be £10,000, to be increased to £15,000 if required.

Application should be made to the Government for leave to prospect in the district selected for trial, with the option of leasing a fixed area, of any auriferous ground that may be discovered,—say a block of one mile by half a mile.

When this leave is granted, the Company should proceed to the selection of an officer to conduct the Mining operations, and the utmost care should be exercised in this respect,—as the ultimate success of the adventure must in a great measure depend on the Manager. He should be a man of strict integrity, and business habits,—*thoroughly acquainted with Mining in all its branches*, and experienced in the management of large establishments. He would require two officers under him—a Mining captain—and a captain of the crushing floor.

Nearly all mistakes made by companies may be traced to inefficient management—caused either by the Directors giving the appointments to friends or relatives, irrespective of fitness—or else through a mistaken economy—declining to pay for really efficient men. To avoid the former of these evils—the selection of the under officers should be left to the Manager (subject to the approval of the Company) and it should be distinctly understood, that no Shareholder will attempt to influence his choice,—as he should be the best judge of the tools with which he must work, and is also thus ren-

dered more thoroughly responsible for the proper conduct of the operation.

The Manager and two under officers will then proceed to the district agreed on,—taking care to have with them, such letters to the local authorities as will ensure the necessary facilities for carrying on the work. They will then proceed as follows :—

After an eye survey—a sketch map of the district should be formed—or if there is a Government map, the details should be roughly filled in,—minute accuracy not being necessary.

On this map should be laid down the position of the Quartz bands, and the leads of alluvial Gold—noting where the latter have been rich or poor—and if possible tracing them up to the Quartz bands, from whence the Gold has been liberated,—for the pupose of ascertaining what portions of the band have been most productive, and which is the richest line of Quartz.

The Quartz veins should then be examined to ascertain their local peculiarities,—and should any Quartz workings exist—they ought to be examined, and the character of the veins in depth carefully noted.

After all possible information has been thus got together and well digested, the area allowed should be marked out on the most promising ground, and one or more shafts sunk on the veins, —when a short trial would shew, if it were advisable to go on or not. Should the appearances be unfavorable—the ground would be abandoned, and a new area selected—but if the veins yield payable Gold—the works should be extended with a view of proving whether such an amount of paying Quartz exists as will warrant the erection of machinery—as also for accumulating a stock of Quartz before the machinery was got to work.

In erecting crushing machinery—I should recommend an engine of 30 horse power, with multitubular boiler (*i.e.* locomotive boiler) working two twelve head batteries of stamps—which would give a crushing power capable of operating on from 230 to 250 tons of Quartz per week. It might be advisable to try one battery of 12 heads first, but this will depend on the appearance of the ground opened, and the supply of Quartz, as the cost of *working* 24 heads does not much exceed the cost of working 12 heads.

I have given this outline of the preliminary operations,—principally to shew the necessity of the Company waiting patiently, and not hurrying the Manager in the selection of the ground. A few thousand pounds might be expended in this way—the amount being more or less according to the difficulties to be overcome,—but this would secure the further outlay, and render ultimate success as much a matter of certainty as is possible in Mining adventures.

Should the Company once strike paying ground —the returns would be large,—and a small portion of the profits applied to the developement of new blocks of ground, would, (with the experience gained in the first operation) lead to large establishments, and I firmly believe to enormous profits. Such has been the result of Mining companies conducted on this principle in England—where the competition is great, and the opportunity of selection limited, and the chance of success must be vastly increased, where there is an untouched field to begin on—the value of which has been already proved.

It is important that the accounts and work of a Mining establishment should be laid before the Company from week to week, in such a way as to render them easy of comprehension—and to effect this the weekly accounts should be in a tabular form—consisting of a labor sheet, a contingency sheet, a cash account, and a crushing account. A copy of the diary, giving a description of the work going on each day, and the way the men are distributed should be sent weekly, also copies of the weekly reports of the under officers—and such other explanations as the Manager may deem necessary. The company should write for further information on any points that are not clearly explained. But while taking care to be fully informed of everything going forward in the establishment—they should if possible avoid interfering with the conduct of the work—more especially in the details, as their distance from the scene of operation, and want of experience renders them liable to error,—to say nothing of such a course weakening the responsibility of the Manager, and causing much ill feeling. In case a Manager cannot conduct affairs without this—it is better to remove him and put a fitter man in his place. If however the difference in views is not of serious importance—more would be lost in requiring the Manager to pursue a line he could not approve—than in giving him his own way.

In the above outline I have endeavoured to sketch out a general plan of operations—dwelling mainly on those points, where companies are most liable to get wrong. It would require a volume to go into all the details a Manager has to arrange —or the observations he has to make before coming to a decision as to the most promising ground for trial—or the veins most likely to repay the outlay of capital, and no written instructions could supply the place of practical acquaintance with the subject—but a few remarks as to the character of the Quartz bands of Victoria may be useful.

The description of veins most frequently met with in this colony are considered by miners as worthless for the production of the baser metals, but the great comparative value of Gold renders a small per centage payable, so irregular and so uncertain are they in form, and so frequently does this change— that it requires the utmost care on the part of the miner, in making and arranging his observations to ensure a fair chance of success, —and even with all this care he should calculate on several disappointments before attaining his object. The most common form in which these Quartz veins are found is—

1st. The split veins—or those running and dipping in the same direction, as the cleavage planes, with regular well defined walls. Where they bear Gold, these are well suited to large operations, producing a large amount of Quartz, and setting down to a good depth, with little diminution in the yield of Gold, especially in the softer rocks.

2nd. Flat veins,—laying horizontally like a coal seam—they are often productive in Gold—but liable to dwindle to a mere joint, and I have not met with any likely to produce a large amount of Quartz.

3rd. Oblique veins,—running with the cleavage planes but dipping across them at various angles, and from a few inches to several feet in thickness. A number of these are often found running parallel, one below the other at uncertain intervals, all terminating in depth in a vertical joint or clay vein, the latter frequently producing Gold. These oblique veins are often very productive—but they are more uncertain than the split veins. It should be noted whether they are of such a size as to produce a large amount of moderately productive Quartz, or thin and yielding rich Quartz. I prefer the former for working on a large scale.

4th. Irregular veins. On the surface these may present appearance of regular split veins of great thickness, often with a most deceptive show of

Gold—but on sinking they will be found mere wedges cutting out a few feet in depth. Continued trial may discover more detached masses of Quartz on the line of veins—but all partaking of the same character. It is rarely these masses can be worked to profit, and the amount of paying Quartz should be ascertained before heavy outlay is incurred.

The Quartz bands are continuous for many miles in extent and may assume all the above forms at different points, or even be almost obliterated in some parts of the line, neither do they bear continuously having alternate barren and productive portions the positions of which must be ascertained by actual trial. Besides the above, we have true mineral veins crossing the cleavage planes both in direction and dip. The value of these when running at a favorable angle across the auriferous schists would be incalculable, but unfortunately they are few and far between. I have only met with one known as Davies' vein at Steiglitz, which was a true but weak vein varying a few degrees from the direction of the cleavage planes, and dipping across. At the top the Quartz gave from 20 ozs. to 30 ozs. of Gold per ton—but this was only a surface aggregation—and at 40 feet in depth the yield had fallen to from 4 to 7 ozs. per ton, which rate it still maintains at 200 feet in depth.

Somewhat analagous to true veins are the joints occasionally striking off from the split veins, nearly at right angles to them, and sometimes producing a few hundred weights of very rich Quartz yielding at the rate of from 50 to 150 ozs. of Gold per ton.

H. A. THOMPSON.

CLUNES MINE.

The block of schist ranges traversed by the quartz bands, which have fed the alluvial mines of Ballaarat and Creswisk, are bounded on the east and west, by the trap rock, effused at a comparatively recent date, and covering up all the lower schistose country. After crossing the dividing range at Creswick, the bands dip altogether under the trap which has here inundated the whole district, forming extensive plains diversified by volcanic caves. In consequence of this change of surface, the waters from the dividing range had to seek out new channels, and have since worn out deep vallies in the trap plains. One of these modern vallies crossing the top of an old schist range, has worn away the trap overlaying the latter; thus exposing the quartz veins forming the mining field of Clunes. On the south side of the valley the schist is covered by 60 or 70 feet of trap; on the north side, is a rounded schist hill traversed by the quartz veins. This northern side was included in the pre-emptive right purchased by Messrs. McDonald and Co., and was leased from them by the Port Phillip and Colonial Gold Mining Company, for a term of 21 years, subject to a Royalty of 10 per cent. on all the gold raised, and to the usual conditions to work the ground in an energetic and minerlike way. The lessees retained the crushing of the quartz at a fixed rate of £3 per ton, but re-let the working of the veins to a Co-operative Company, (consisted of 100 working shares, and 10 free shares, the latter paying the expenses of management, and clerical assistance), who are bound to supply the machinery with 300 tons of quartz per week. The contract price for crushing has been modified according to the yield, when the latter is over 1½ oz. per ton, the present price is £2 15s.; under 1½ oz., £2 10s. per ton. This includes roasting. This arrangement has answered so well for the Co-operative Company that the working shares are selling at £220 each.

The crushing machinery consists of 44 head of stamps and one Chilian mill, the whole capable of operating on 350 tons of quartz per week, yielding from 500 to 550 ozs. of gold per week.

Much prejudice existed against the stamps at first, but a trial extending over many months has proved, that when worked with due care, the stamps will retain more gold than the Chilian mills, by from 2½ to 5 per cent.

With this is a rough plan and sections of the mining works.

FIG. 1 is a plan of the field, showing the direction of the veins, the boundary line of the trap, and the positions of the levels, and crushing works.

The high and south levels have been driven to the East vein; the low level has been carried through the East vein, with the intention of exploring the ground beyond, to ascertain if any other veins exist in that direction, for they would not show at this surface on account of the overlaying trap.

FIG. 2 is a section across the veins on the line of the low level. The depth to which the engine shaft has been sunk is shown by black dotted lines, and the projected workings below the water line by long dotted lines. A 30 horse power engine with 10 inch pumps, is now on the road from Melbourne, to be fixed for working the deep ground, and soon as this is ready the lowest drive will be opened to the veins, to drain the ground above, and the working of the quartz will begin in the top drive.

FIG. 3 is a section from north to south on the line of the East vein, showing the progress of the workings up to the present time. The quartz has been taken out where it is shaded with black lines, the blank spaces are yet to be worked. To the north the trap is shown overlaying the schistose rocks. The north shaft has been sunk through the trap; below it was found the old alluvium containing gold, and then the schist rock enclosing the quartz veins; a little further to the north the schist again rises towards the surface.

FIG. 4 is a section on the line of Robinson's vein. The long dotted lines show the proposed method of working below the water line,—by first dividing the ground into blocks, and then stopping down the quartz. Tramways will be laid down in each drive for taking the quartz to the engine shaft. The other veins will be worked in the same way.

FIG. 5 is a section on the line of the West Vein. It is broken to the north at the termination of the shaded portion, the line of break dipping at an angle of 35 deg. from the horizon.

The working of the old man vein has only just begun, and none of the quartz has yet been tried.

CRUSHING MACHINERY.

With this is a tracing from an isometrical sketch by Mr. Dumaresq of our new 12-head stamping mill. It is divided into three compartments, of four heads each. The quartz is emptied into the large hopper, and is conducted thence to each compartment by small self-feeding hoppers as required. A supply of from 20 to 25 gallons of water per minute is let into each compartment from a trough running along the back of the stamps. The stampers, weighing about 500 lbs. each, are raised by cams inserted in the cam-barrel, and each strikes from 66 to 76 blows per minute, with a lift of 10 inches. The escapes are in the front and back, extending the whole width of the coffer and about 8 inches high; they are

covered with fine gauze through which the pulverised quartz is carried by the dash of the water. In the coffers two beds are used with a layer of loose quartz between them, the upper bed, on which the quartz is broken, being a loose one, considerably less than the area of the coffer. About 70 per cent. of the liberated gold drops down into the loose quartz, where it is retained until the coffers are cleaned out, usually once a week. The remaining gold passes out with the water and sand, and is carried over blankets laid on the strikes, which are changed and washed at fixed intervals.

The accumulated blanket sand is put into a horizontal barrel with mercury and a little water, and left to revolve for twelve hours, when the gold will be found to have been dissolved by the mercury. The barrel is then emptied into a cistern, and the sand washed off in a shaking table, leaving the amalgam behind, from whence the gold is obtained by distillation in the usual way.

Additional Particulars respecting the Mining Operations at Clunes, Collected on my late Visit to Clunes.

One great peculiarity in this mode of quartz crushing is the large amount of gold which is obtained without the use of mercury. About 70 per cent of the gold is caught in the trough bounded by wire gauze. The bottom of this trough is peculiarly fitted for retaining the gold separated by the crushing process from the quartz. It is composed first of a layer of bluestone and quartz, beaten by the stampers into a compact dry mass; over this is placed a layer of rough stones, and over these iron plates of sufficient length to receive the blow of two stampers. The width of these plates being considerably less than that of the trough the larger grains of gold separated from the quartz escape round the plates and take refuge among the rough stones beneath. They are recovered once a week when the trough is cleaned out. Of the gold which is carried with the quartz through the wire gauze, fifteen per cent. is caught in the gutter between the trough and the strikes; the remaining fifteen per cent. being caught in blankets on the strikes along with much dirt.

Thus 85 per cent. of the gold is extracted from the quartz without the aid of mercury. The advantage of this method over that of extracting gold by the Chilian Mill is in this respect very great, especially where auriferous quartz contains mundic, as it often does.

This mode of extracting gold from quartz is also to be recommended on the score of general economy.

The engine employed at Clunes to drive 12 heads and to raise water at the rate of 50 gallons a minute to the height of 30 feet did not exceed 20 horse-power. The consumption of fuel was 2½ cords of wood a day of 24 hours, a cord being 128 cubic feet piled, and obtained for 23s.

The cost of setting up 12 heads or stampers, including labour and material, is estimated at £1000 for the first 12 heads, and £700 for every additional twelve heads.

Now twelve heads were found to crush 20 tons in 24 hours, the cost of fuel thus did not exceed 3s. for every ton crushed. The cost of wear and tear, of mercury employed, and of superintendence, I did not obtain, but I was informed that the entire crushing expenses did not exceed 30s. a ton, in which sum is included the roasting of the quartz previous to crushing. It was also stated that the excavation of the quartz from its natural bed did not exceed 10s. a ton. Thus 40s. or ½ ounce of gold per ton may be said to cover all expenses. As the average yield of gold is 1½ ounce from the ton of quartz, and 50 tons are crushed daily, it is evident that very handsome returns must be obtained for money invested in this crushing machinery.

The strikes which are shown in the isometrical drawing are found to return, as before stated fifteen per cent. of the gold released, and indeed all that escapes from the trough and adjacent gutter. The tailings from these strikes have been often tried and found to contain in the average but 6 grains of gold to the ton, a quantity unworthy of consideration.

I presume it is hardly necessary for me to point out how advantageously this process of working quartz veins could be applied to quartz reefs in this colony. I took every pains to satisfy myself on this point, and I can confidently commend the process. It is also capable of much improvement.

As regards this colony, I am informed, there are miles in extent of auriferous reefs in the neighbourhood of Adelong and Tumut, many of which contain gold in quantity not less than 8 or 9 ounces to the ton, and none less than 2 ounces to the ton. What hinders the erection of crushing machines by persons possessing a little spare capital, who might undertake to crush for the digger, either at a price per ton, or for a percentage of the out-turn? or what hinders the diggers here forming a co-operative Company (in which every man should have a direct interest in the concern), as the diggers at Clunes have done, and by systematic labour under the direction of an experienced manager obtaining liberal returns? No capital is necessary to form such a company. At Clunes each digger paid down but £15, which went towards fencing in the land. For this small outlay and by the application of more labour, each received on an average £8 per week. The Quartz Crushing Company which crushed at a contract charged as stated by Mr. Thompson, from 50s. to 60s. per ton, and is crushing 50 tons a day, is realizing 20s. profit on every ton crushed, or £18,000 per annum, in return for an outlay of capital not exceeding £7000.

The poorest reefs at Tumut and Adelong are richer than the Clunes reef. If the Clunes mines by the application of the labor of 150 men, and the expenditure of some £10,000 at most in machinery yields £100,000 per annum, what may we not expect by energy well applied to our own gold-fields?

In conclusion, I wish you to carry away with you the following facts which I consider established by the experience in gold mining, obtained at Clunes.

1st. By the expenditure of £1000 machinery can be obtained and set up capable of crushing sufficiently daily 20 tons of auriferous quartz.

2nd. For the extraction of gold from quartz, the working expenses exclusive of mining need not exceed 30s. per ton operated on.

3rd. It has been proved at Clunes, that co-operative companies for the working of auriferous quartz reefs can be formed by men possessed of a few pounds sterling, and can be worked advantageously, and that such companies in which every labourer has a direct interest are eminently suitable for the protection of the labourer against the capitalist, and will therefore be popular with the poor miner.

E. W. WARD.

ON THE MORTALITY OF SYDNEY, FROM THE 1ST MARCH 1857, TO 28TH FEBRUARY, 1858.

BY CHRISTOPHER ROLLESTON, ESQ., REGISTRAR-GENERAL.

AT one of the early meetings of this Society, in the past year, I laid before the Society, a paper showing the Mortality of the City of Sydney, during the year preceding; that is, from 1st March 1856 to 28th February 1857, and I drew some comparisons between the tables prepared from the Registration Returns of Sydney, and those of London. It was shown that the total Mortality of Sydney during the period in question, as compared with the population, had exceeded that of London in a year of cholera, and the mean deaths of the whole of England, for the last 17 years by 0.266 or ¼ per cent.

This somewhat startling discovery, established upon unquestionable evidence, has had the effect of calling public attention to the sanitary condition of the city, and to the necessity for applying remedies to some of the social evils which are found to excite and aggravate diseases fatal to the human system.

The quarterly reports of the Health Officer of the city, have further contributed to expose many of the sources from which diseases arise, and from which future danger is to be apprehended.

As some desire will naturally be felt to know, whether the result of the first years registration is borne out by the experience of a longer period. I now lay before you, returns exhibiting for the year, from 1st March 1857 to 28th February 1858, no very marked improvement, I am sorry to say, in the sanitary condition of the population.

The proportion of the deaths of children under 5 years of age, to the total deaths exhibits a slight increase being at the rate of 45.26 per cent. to 43.43 per cent. the year before.

The deaths recorded directly from intemperance were not less than 48, and how many indirectly, the records do not show.

The deaths from different causes for the two years will be found compared in a separate table.

The proportions do not differ very materially, and I may here state, that the classification adopted is copied from that prepared by Dr. Farr for the tables of the Registrar-General of England.

Unfortunately, I am unable to give the Mortality as it occurred in the different localities of the city. The labors of the office have not as yet, admitted of my entering into many minute and interesting inquiries touching the topographical fatality of diseases, and I much doubt whether I shall be able to arrive at any very satisfactory solution of the problem, until I get a census of the population taken with reference to the degrees of elevation.

I am, this year, endeavouring to classify the Mortality in wards, but it is manifest that this classification must be very unsatisfactory, as the wards are laid out to embrace high, healthy, and thinly populated and low, unhealthy, and densely populated parts of the city without distinction.

As a contribution to Medical Statistics, that in a few years will become of inestimable advantage to the diagnosis of diseases in this part of the world, I would earnestly invite the co-operation of the Medical profession, not in Sydney only, but throughout the colony, to enable me to make the tables of Mortality as perfect and as reliable as it is possible.

It is manifest, that the information regarding the "cause of death," however, much care is taken in ascertaining it correctly, cannot have the same value from unprofessional testimony, as it must have if it were recorded on the certificate of a duly qualified member of the profession.

Hitherto, about one-third only of the causes of deaths are so recorded, and as the promotion of medical science is one of the many useful, and certainly not the least important purposes, to which the facts collected may be applied, I do not doubt that as the importance of the object becomes more generally known, the co-operation I ask for will be readily and universally accorded.

CHRISTOPHER ROLLESTON.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

TWENTIETH MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange.

Tuesday, September 7, 1858.

Members of Council present:—Messrs. W. G. Ainsworth, William McDonell, W. Carron, J. Graham, and Dr. Houston.

Mr. W. McDonell in the Chair.

MINUTES.

Minutes of the last meeting read and confirmed.

LETTER.

The Secretary read a copy of a letter which had been forwarded to his Excellency the Governor-General from Thomas Bayley, Esq., of Manchester, to John Bright, Esq., M.P., respecting some cotton produced on some of the South Sea Islands, which his Excellency had sent to England for the report of the Cotton Brokers.

A question being asked by one of the members respecting the kind of cotton,

The Chairman remarked, that no doubt it was one of the tree cottons, several of which he had seen growing in the Islands of the Pacific.

PAPERS READ.

The Secretary proceeded to read a paper from Mr. Lewis Markham, of Armidale, on Meteorology, which when he had read about half through—it was proposed by Mr. W. Redman, seconded by Mr. W. L. Bugle, and carried unanimously—that on account of the great length of Mr. Markham's Paper, the reading of the remainder shall be postponed to the next meeting.

SORGHUM SACCHARATUM.

Mr. W. Redman read a paper on the Sorghum Saccharatum.

The Chairman said he wished that all gentlemen who had made any experiments with the Sorghum, would follow Mr. Redman's example and make their results known to the Society.

Mr. Redman stated, in addition to the information given in his paper, that he believed the Imphee superior to the Sorghum.

Mr. J. Graham mentioned that he knew of a gentleman sowing barley between the rows of Sorghum, with good results, and that the plant did not contain saccharine matter until it attained its growth and commenced ripening its seeds.

SEEDS PRESENTED TO THE SOCIETY.

The Secretary laid a quantity of seeds on the table, which had been presented to the Society for distribution by Monsieur Clouquet, Belgian Consul, they consisted of Hemp, Field and Sugar Beet, Clove, Malting Barley, Buck Wheat, Flanders Wheat, Vetches, Lentils, Turnip, Prairie Grass, and Flanders Pine ; in the letter which accompanied the packet of seeds, Monsieur Clouquet particularly mentioned the good qualities of the Flanders Wheat, Meadow Grass, and Sugar Beet.

NOTICE OF PAPERS FOR NEXT MONTH.

Mr. W. Redman on the necessity of Roads to keep pace with the necessities of Agriculture wherever public lands are disposed of.

His Excellency the Governor-General Notes on the Supply of Animal Food to the Inhabitants of New South Wales.

Mr. Robert Weston on the Preservation of Grain and Destruction of the Weevil.

The next monthly meeting will be held on Tuesday, 5th October.

MR. EDWIN HICKEY'S STUMPING MACHINE.

In our last issue we gave a description of a machine that is alledged to have been used with great success on the banks of the Hunter in extracting the stumps of trees. Our engraver was not able to get the illustration ready in time for publication last month, it will, however, be found among the illustrations published on a separate sheet with this number.

AUSTRALIAN COTTON.

Manchester, 2nd June, 1858.

MY DEAR SIR—I am glad that you continue your valuable aid to your old constituents, whose famine in cotton and corn you have already endeavoured to relieve. To the Speaker of your honoured house, as well as to yourself, the trade ever will feel grateful for the kind attention in forwarding a sample of cotton from Sydney. I have examined this sample with great care, and I find that it possesses most estimable and desirable qualities for the spinning good and strong cotton yarn. If it were sent to the Liverpool market in perfectly clean condition, it would be worth 9d. per lb. My opinion of its merits and value has been confirmed by my friends, of the Cotton Supply Association, who desire me to convey through you, their high sense of Sir W. Denison's services in promoting the cultivation of cotton, and they have instructed me to offer for his acceptance, if he will take the trouble of placing them, where they can be used, two cotton cleaning "Macarthy Gins" which, indeed, might be given by him as prizes to meritorious young cotton planters. Having some time ago been much pleased with the cotton cleaned by this new Gin, I at once imported one from the United States, and have allowed my friends to make similar Gins, which we are now extensively distributing.

The locality where Sir W. Denison's sample of cotton has been grown, would, I am convinced, by proper cultivation and by the introduction of the best kinds of seed, yield very superior cotton, and if Chinese men and *women* were introduced as settlers there, they might certainly grow cotton very profitably ; if each married settler had a plot of ground of 20 acres entrusted to him, and if successfully applied to the cultivation of cotton for 3 years, then given to him with permission to buy to the extent of 100 or up to 1000 acres, upon easy terms, it is probable that a new and most satisfactory industry would be established ; an acre of land suitable for the growth of cotton ought to produce 320 lbs. of good clean cotton, which at 7½d. to the grower, would yield £10, and then the value of 9d., would leave 1½ for freight and merchants profit, and would estimate the gross production of cotton per statute acre, at about 1350 lbs. of which 1030 lbs. would be seed, and 320 lbs. clean marketable cotton. This seed grown with the fibres of cotton is an additional source of profit, and can be made into good oil cake for cattle or converted by crushing into liquid oil for many useful purposes. A moist atmosphere in the vicinity of the sea, conduces to the value and extent of the cotton crop.

I am sorry that I had not the pleasure of seeing you when you were last in Lancashire, but I am delighted to hear of your robust health, and I congratulate you upon your late mental achievement.

Believe me, to remain,
Most faithfully yours,
THOMAS BAYLEY.

John Bright, Esq., M.P.

ON THE CULTIVATION OF THE SORGHUM SACCHARATUM.

MR. PRESIDENT AND GENTLEMEN,

I was led to my present subject, the growth of the Sorghum, simply because another member Dr. Gunst, had proposed to treat of its manufacture into sugar, and in order that the two subjects so properly connected might be simultaneously offered for your consideration. The choice of subject therefore with me has been one

rather of accident than design, and as our joint experience with regard to this plant is somewhat limited, I can add but little to the common stock. However, being a most prolific plant as well as a good servant, colonially termed, generally useful, we may yet render it not only available for home consumption, but discover in the manufactured products of it or its kindred family, a valuable export, whenever its general cultivation shall more than satisfy our local wants.

I have grown the Sorghum in two opposite soils.

The first about an acre, at the Punchbowl, in a stiff and heavy earth; the subsoil an impermeable clay, with a partial admixture of iron stone or gravel, and the top an average mould with small gravel more or less through it. In this description of soil, you will recognize that of Newtown, Parramatta-road, Petersham, and the greater portion of the County of Cumberland. The land was new, not sweetened by long exposure or mellowed and enriched by previous frosts, but in that unfavorable state called sour; to counterbalance which it received the slightest sprinkling of guano, say 1½ cwt. to the acre.

The seeds were dibbled 9 inches apart, at a shallow depth, say 1 inch, and the spaces three feet; it was planted as late as November. The seeds nearly all germinated, and flourished without further attention. The ground like all recently cleared bush and was tolerably free from weeds and grasses, and I caused the usual subsequent hilling or earthing up to be purposely neglected in order to test the amount of attention the Sorghum could dispense with. It continued growing during the summer notwithstanding severe storms, and partially ripened before the approach of winter; the ripening was not general and varied over a period of two months. Had it been all cut while young, it would have ripened more equally and the crop increased rather than decreased. The effect of cutting is beneficial than otherwise. It is then the fecundity of the plant asserts its reproductive powers; from the roots and around the old stalk new plants arise, varying in number but all producing their head of seed; even after this, and when the matured stalks with their seed bearing heads are cut down. Again and again will the original plant continue its productive power, but for how long or how many seasons my limited experience will not sanction anything like a dogmatic assertion, although various statements are made as to its lasting powers, but I think whatever the duration of its life, its growth is too rapid and certain to justify the long continuance of old plants, and as our winters would rather retard the young and tender shoots. I believe the summer culture only to be depended upon, and that further trials will justify using the ground, for some certain winter crop thus benefitting the soil by the rotation. The stalks of the young Sorghum forms excellent green food for horses, cattle, and pigs—horses, though unaccustomed to the food will eat the seeds after putting a few heads in their mouth, but poultry devour them more greedily.

When the seeds are nearly ripe, the leaves may be plucked from the stalk (for the use of the cattle), without injury. After cutting, the stalks retain their succulence for a considerable period, as the juices do not readily evaporate, and standing in winter they retain the green state unlike the corn that dies suddenly away and becomes dry.

The Sorghum, I will answer for, peculiarly adapts itself to our climatic changes; in a moist season it will flourish luxuriantly, and in the very driest seasons it holds its own. I have seen it growing in indifferent soil (when no rain had fallen for months,) rearing itself proudly against the blazing sun, not a blighted leaf, but green and beautiful, and with a bloom upon the stalk like a newly plucked grape, while the maize growing in the same field had a scorched, sickly, and withered appearance; many plants failing and giving way to a drought which left the Sorghum perfectly unscathed. Last summer was the time alluded to and these tests of ordinary soil, imperfect cultivation, and dry and continued heat were trials sufficiently severe to try this new plant amongst us, and stamp it as pre-eminently fitted to withstand the alternations of our climate as well as the slovenly mode of culture so generally pursued. If the maize is emphatically the poor man's crop from the hasty manner it will bear putting it and the little attention subsequently demanded—the Sorghum will at least vie with, if it does not rival it.

The second soil in which I grew the Sorghum was sandy and on a rocky subsoil. Here it was sown in drills, as well as broad easy, without manure, but both succeeded; the drills best; in this intance it was sown in October; the situation 1 mile from the sea coast, and about 5 miles from Manly Beach; parts of this district if I am pardoned for the degression contain many choice spots suitable for orchards and general agricultural purposes, but it is difficult of access, and although land has been sold there by past Governments for the least 50 years and sales continued by the present one, not a fraction has been laid out in roads, and one great obstacle exists only ½ a mile from the beach in the shape of a lagoon, which must be crossed to get at the land beyond—of all the places in the vicinity of Sydney, it is the best suited for orchards, and is of all places the most neglected; this leads us to the consideration of another subject which I beg leave to introduce at a future meeting, viz.—The necessity of roads, to keep pace with the necessities of agriculture, wherever public lands are disposed of.

W. REDMAN.

AMERICAN WASHING MACHINE.—We had the pleasure of inspecting, a few days ago, a very ingenious portable washing machine, which is now exhibited for sale at Mr. Lee's Repository in Park-street. We have heard a very high character given to the work performed by this apparatus, and append a notice of it that appeared in the *Times* newspaper. It is not expensive, and we should imagine would save its own cost in a very few weeks.—"The essential character of this new implement consists in the employment of floating balls in the operation of washing. Some 200 or 300 of these balls, each of which is about the size of a Seville orange, and made of elm wood, are put into a wooden trough, two or three feet long by fifteen inches deep, containing water or soap-suds, in which they all float. A fulcrum is placed at the back of the trough, having a cross-beam attached to it, resembling a common pump-handle. On one side of the fulcrum an apparatus like a small window-sash, to which the clothes to be washed are fastened, is suspended from the cross-beam immediately over the mouth of the trough; and at the extreme end of the beam, on the opposite side of the fulcrum, is a box into which any weight may be put until it slightly weighs the sash up in the air. This done, the person performing the operation moves the beam handle up and down, as if she were pumping water, the effect of which is to immerse the sash laden with clothes among the balls and suds, and move it about among them. The balls produce a gentle friction upon the linen, which, without in the slightest degree injuring its fabric, or

breaking or tearing off buttons, effectually removes every trace of dirt in an incredibly few minutes, and the operation is complete. The labour required is so slight that a child from twelve to fourteen years of age may perform it with ease. In some of the machines of larger size and greater cost, the requisite motion, produced by turning a wheel, is even done at less trouble. The action made on the linen is equivalent to the ordinary threefold process of pounding, rubbing, and squeezing, and as it can never exceed the resistance offered by the floating balls, it is thereby kept within bounds, which are perfectly safe for the most delicate fabric, the wear and tear being, indeed, less than in ordinary washing by hand. The machine was invented two or three years ago by one Christopher Hollingsworth, a farmer in Indiana, whose patent rights, so far as they relate to the whole continent of Europe, have been purchased by Mr. Moore and his partners in Holborn. They exhibited the implement at the Paris Exhibition, where it attracted considerable interest, and numbers were sold. The consumption of soap and fuel is much less than in washing by hand; and the fingers of the operator are never wet during the process, except to the extent necessary in putting the clothes into the sash, and taking them out and wringing them when washed. In the saving of labour, time, and material, its advantages can scarcely be exaggerated, while the price is not such as to preclude it coming into general use."—*Times.*

VESSELS LONGER THAN THE LEVIATHAN. While public attention has been attracted so strongly by the unusual dimensions of the Leviathan, that the name of that vessel is in everybody's mouth, it happens singularly enough that two vessels of greater length, and of a more remarkable character, have been advancing to completion in Liverpool without the general public being even cognisant of their existence. These vessels are each seven hundred feet long. They have been constructed by Messrs. Vernon and Son, for the Oriental Inland Steam Company, and are intended for the navigation of the Indian rivers. The purpose of their peculiar features of construction is to enable a large cargo to be carried at a good rate of speed upon a light draught of water. The great rivers of India, though penetrating far into the interior, and though containing large volumes of water, are nevertheless shallow during the dry season. The vessels navigating them must, therefore, float very light, and yet they must have displacement enough so carry a good cargo. They must have strength enough not to suffer injury if they should get aground, and they must present such little resistance to the water as to be able to achieve a satisfactory rate of progress against the stream. All these indications are admirably fulfilled in these vessels. The necessary displacement is got by giving the vessel great length. But as great length, without other provision, would imply great weakness, each vessel is broken up into six parts, each of which parts floats, and is a complete vessel in itself, so that each vessel consists, in fact, of six independent vessels or barges, of which the first one is a steamer towing all the rest. The constituent barges of the train, however, are so articulated to one another by circular joints as to leave no material vacuity between them, while permitting the train to bend sideways in passing any curve in the river; and the train will not suffer injury should it ground upon an uneven surface, since each barge will settle on the bottom for itself, which the nature of the connections enables it to do. If barges of the common form were placed side by side, instead of articulated barges being placed end to end, it is clear that the resistance would be so much increased that but little progress could be made against the stream; whereas by the mode of construction adopted, this impediment is altogether averted. We cannot but regard the construction of these vessels as a vast step in advance in the art of navigating shallow rivers by steam, and as we understand that, even with very imperfect vessels, the navigation of the Indian rivers has heretofore returned a profit of from thirty to forty per cent., we cannot doubt that, with such improved efficiency a still more eminent measure of success will be attained. We understand that this new species of vessel was designed by Mr. Bourne, civil engineer, ten years ago, to correct the defects which his personal investigations in India enabled him to discover in the common modes of navigation pursued in that country; and after it had received the warm approbation of all the most eminent engineers and ship-builders in this country, it was subjected to practical experiment with the most complete success, and finally, after matured research and practical demonstration had been gone through, these vessels have been constructed.—*Liverpool Albion.*

GENERAL STATISTICS OF GOLD.—In 1848, the total amount of gold in use in the world was estimated by the best authorities at about £600,000,000 sterling, and the annual supply was believed to be between eight millions and nine millions sterling. From the recent extraordinary influx consequent on the opening of the gold fields of California and Australia, we may compute the amount now in hand at about £820,000,000 sterling. The data in this estimate are as follow:—

From a table in Westgarth's *Victoria*, it appears that these two regions have produced as follows:—

California.	Australia.
1849.. 2,000,000	None.
1850.. 9,000,000	None.
1851..13,000,000	1,000,000
1852..15,000,000	14,000,000
1853..20,000,000	20,000,000

Or California an addition of	£659,000,000
Australia ditto	35,000,000
All other sources in five years ..	40,000,000
To those add the present product of £50,000,000 per annum from all quarters for two years	100,000,000
	£834,000,000
From this deduct for waste, estimated at £2,000,000 per annum for seven years	14,000,000
	£820,000,000

This net product now in the world is equiva-

lent to about 205,000,000 ounces troy, or 8542 tons. Great as the amount seems, it could be all contained in a cubic block of gold only 23 feet in diameter.

The gold coinage in Great Britain, France, and the United States, amounted in 1843 to £4,200,000, and in 1853, it was £41,800,000, or nearly tenfold as large.—*Edin. New Phil. Journal*, No. 7.

Improvements in Paper-making.—Mr. Dickenson has introduced a method of manufacturing a paper which, by possessing on its opposite sides varying characters of surface, will permit of its being used indifferently for copper-plate or lithographic printing. For this purpose are brought together in a very wet state (that is to say, in an unfinished stage of manufacture) two webs of paper, as they are delivered from their respective machines; these webs are combined into one by pressure, and are then dried and consolidated, so that they shall form one homogeneous web of paper. One of these webs is formed on what is known in the trade as the "Fourdrinier" or "Shaker" machine, and the other is formed on the cylinder machine. The arrangement of machinery which is employed in carrying out this new manufacture consists of a shaker machine, and a cylinder machine, combined with a suitable arrangement of felts and guide rollers, for traversing the two webs, and also of pressing rollers for expressing the moisture from the paper, and effecting the consolidation of the two webs into one.

Mr. J. L. Jullion has patented the manufacture of paper, card and millboard from certain vegetable productions.

The patentee's claims are thus enumerated:—1. The manufacture of white paper and card from the fibres of the plantain and banana plants, sugar cane, and reeds, by certain described processes. 2. The employment of alkaline sulphurets, or a mixture of alkaline and earthy sulphurets with hydrates of alkalis in the manufacture of paper from straw. 3. The application of percolation under high pressure, combined with an alternating tumbling motion, in boiling all substances intended for the manufacture of paper, card, and millboard. 4. The employment of a rotatory vessel in which a pressure of chloride gas is generated for the purpose of pickling or bleaching materials used in the manufacture of paper. 5. The employment of a current of atmospheric air, either warm or cold, in the process of bleaching, as described.

Mr. J. Fraser has patented an improvement in the manufacture of paper or paper pulp, relating to a mode of treating straw, grass, hay, &c. These are first cut up into suitable lengths, and then submitted to a solution of soda and lime in boiling water, to which is added common resin. To prepare the solution the patentee dissolves 1lb. of soda or potash in two gallons of water; to which he adds, in small quantities at a time, about 1lb. of common lime; and the liquor is first kept well stirred, and then settled and strained; and to every 100 gallons of clear liquid 2lbs. of common resin must be added. The mixture should then be boiled again until the resin is dissolved, and the liquor is uniform. Thus prepared, a vat should be about half-filled with the liquor, and as much fibre as the liquor will thoroughly saturate placed in the vat, and completely immersed. The whole should then be boiled three or four hours. The straw is then to be washed in water, and it will be ready to be ground into pulp.

Mr. J. Fraser has patented the means of making paper from straw by the following process. An alkaline ley is prepared by dissolving 1lb. of soda or potash in 2 gallons of boiling water, and then adding 1lb. of lime in small quantities, keeping the mixture stirred and boiling for an hour after the lime is added. Salt is then added in the proportion of about ¼lb. to 100 gallons of the mixture. As much as the liquor will saturate is now placed in the vat, and boiled for three or four hours (or the straw may be steeped in the liquor when cold, for twenty-four hours). The straw is next taken out of the vat, drained, and well washed with water, after which it is ready to be ground into pulp.

Immense Engine Crank.—At the Mersey Steel and Iron Works, at Liverpool, there has been made the largest Double-throw or Locomotive Crank ever forged, complete, weighing some seventeen tons. It consists of masses of wrought iron welded together, and condensed by a steam hammer of nine tons weight; the forging of the crank being in detail, each end of it subject to operation separately. The masses of iron were suspended by a crane, and the portion to be wrought was inserted in an immense furnace, and completely surrounded by its intense heat. The glowing metal was then moved by a crane, and guided by thirty-five men to the anvil beneath the steam-hammer, the ponderous strokes of which brought it by degrees to the required solidity and structure.

To Ossic.—Bones dissolved by the acids, lose their capacities for retaining moisture, in the opinion of practical men. Green or unboiled bones, from the oily or fatty matter in them, remain long undecomposed in the soil, on account of the repulsion between oil and water. Hence I recommend, in my paper on bones, *semi-decomposition*, by means of the fermentative process, as, in dry soils or climates, the moisture retentive properties of crushed bones constitute not the least of their excellencies.

ROBERT MESTON.

Sydney, October 2nd, 1858.

To the Editor of the Sydney Magazine of Science and Art.

Sir,—Having been some time absent from my home, I have neither had leisure nor opportunity of replying sooner to the critiques of the Rev. W. Scott, in the May number of your magazine, regarding Paragreles, &c.

Yours truly,

R. MESTON.

I hope to make it evident, that the opinions of Mr. Jevons and my own, are not so opposite as the reverend gentleman seems to imagine.

We find in a vast variety of instances, that cause

is commonly put for effect and inversely. People read of the electric fluid, of the sun rising, of Mars and Venus in conjunction, yet philosophically, neither are correct: just so writers, in accordance with general opinion, mention electricity as a something of matter. Now I feel doubtful if there is such an *ens* in nature, as distinct electricity. It is the effect of separation and reunion &c., of certain gaseous elements. Of all known matter, solid, fluid or gases, oxygen, hydrogen and nitrogen have the highest claims to be termed elementary. The first two combined in due proportions form water—the first and last, atmospheric air. Combustion and electricity are only different modes in which oxygen and hydrogen act and react. In their explasive mixtures—the sudden condensation produces intense heat and flame with light.

In nature, oxygen and nitrogen are remarkably connected, producing besides air, fermentation, acidification, alkalinization, &c., &c., &c. Oxygen, hydrogen and carbon constitute the chief organic principia of vegetation, and with nitrogen—flesh is formed.

Chemists have found not fewer than six different combinations of oxygen and nitrogen as atmospheric air, prot-oxyde of nitrogen; nitric oxyde, nitrous acid, hypo-nitrous, nitric acid. Some of these are known as formidable gases or fluids. Then the terrestrial atmosphere is reckoned to have in its volume, heterogeneous mixtures of every kind of matter on earth, or exhalations therefrom. Gases possess great elasticity; extensibility or capacity of diffusion illimitable; very susceptible to changes of temperature, and an astonishing alacrity to regain their equilibrium when disturbed. Imagine the stock in trade of a Sydney druggist suddenly precipitated into the floor of his shop; phials, bottles, smashed, parcels, drawers emptied, into one medley of confusion. What a commotion —the acids and alkalis fighting here a frigorific mixture and ice—there combustions and explosions detonating powders, fluids becoming solids, solids becoming fluids or gases. Our atmosphere is not dissimilar but on rather a larger scale, after a few summer days of intense evaporation, it requires mighty powers, such as thunder storms to restore order.

Heating and cooling—melting and concreting—evaporating and crystallizing—living bodies whether animal or vegetable—and above all motion, motion by winds, currents of all kinds, magnetic included, generate electric disturbances.

The alkaline and negative hydrogen and nitrogen with the powerful acidifying and positive oxygen, are alone sufficient to explain many phenomena, and the effects of an oxy-hydrogen blow pipe exhibit some of their powers, so great in the hands of man, what in the works of Omnipotence!

I am inclined to adopt the opinion of Davy—that electric attractions and repulsions are identical with chemical affinity, and also think, that all atmospheric changes mainly arise from the earth or sea, clouds being the visible accumulating signs, in the atmospheric depository. It is also my opinion that the great rains of 1856-7 depended not solely on evaporation—but also on most extraordinary solutions and re-combinations as it were of the aerial components, for on the 1st and 2nd June, 1857, the two most rainy days in memories registry, Virgil's, *Jupiter "uvidus"* nearly expresses the excessive rainyness, when I and household Lares narrowly escaped a disagreeable kind of navigation without boats, and Grafton was inundated a few days later—a constant broad flash, flashing was visible through the nimbus. Only a low muttering sound could occasionally be heard. If these lightnings indicated oxy-hydrogen union, then it is plain that at times, they combine without explosion, or else some other gases ignite also, perhaps nitrous oxide with some others of the gases. No doubt excessive moisture in air possesses far better conducting powers than a dry condition, but I have not been able satisfactorily (to myself) to solve this mystery.

I may be wrong in some of my ideas, and will feel grateful if put right, but we cannot o'ermaster mind. Alas! after all, I may be only exchanging one kind of ignorance for ignorance of another kind. Theories constantly spring up, and neutralize the old—"as the old burst, new emerge." We are yet miserably ignorant of great nature's chemical operations.

The learned gentlemen is dissatisfied because I follow not the rules of the schools and write Meteorology, pro Climatology. Had Philosophers still followed the system of Ptolemy, or adhered to the Dialectics of Aristotle, science might have still remained in the darkness of the middle ages. Meteor is defined—a body in air, of a luminous and transitory nature, and so the word has been usually applied. Meteors therefore have no great relation to barometric, thermal, moist, or rainy conditions of our atmosphere.

As for the derivation, why the English language is replete, with Latin and Greek; English and Latin combinations, then why not English and Greek. The Logos and its derivatives may be now considered as completely anglicised.

My objections to Electroscopes are nearly stated in the critique; they do not indicate the degrees of electric intensity, which indications I particularly required. This defect may not appear material "in the present state of science," but we know not from what investigations, new light may arise. Both the Messrs. Leslie's promised to send me from London the best they could buy, but colonists when they reach Britain, seem to forget colonial promises and friends; so my electrical observations are all relinquished for the present.

It is my earnest hope that the learned gentleman deems not, that a sneer is meant this twelve observatory stations. Very far be it from him to imagine this. When his Excellency first made the announcement, I hailed the fulfilment with much satisfaction, and in my first paper and best to the Society on that subject (somehow amissing and cannot be replaced) the statement was there made that every district would yet be found to have a particular climatic, not meteoric, name of its own, and that considerable benefits would be derived by the pastoral and agricultural interests inasmuch as vegetable geography, and frequently vegetable pathology depended so much on climate and its relations.

The notes for Mr. Waugh's Almanac were hastily written at his request. Either he or his compilers made sad work of them, omitting one and printing terrene *cultivation*, instead of *alterations*. If the weather only depended on the cultivated area of this colony, it would have little to rely upon, and from the inferior style of farming, bad weather might be expected all the year round.

The subject of Paragreles was nearly omitted. "The utility of paragreles requires more facts and evidence," and so does every concern of human invention. I beg to submit that forests are not collections of living paragreles, all growing trees and plants are in degree—electrics and therefore only partially non-conductors. Bushmen frequently see trees struck, split, shivered by thunderbolts, so they say. These effects partly ensue either from their non-conducting condition or else they stand within the immediate sphere of electric chrages and discharges. The lightning—not the

bolts, are here the causes. Lightning only runs along surfaces, but the intense heat generated by condensation, when oxygen and hydrogen unite, vapourize the sap, and thus trees are blown to pieces by steam. Occasionally sheets of bark, as broad as canvas will be only stripped off, and sometimes strips as narrow as ribbands. Where the stringy barks grow amongst other Eucalypti, these appear to be particularly selected. Mark a tall hoary patriarchal tree, standing alone upon one of our large plains, not a leaf to screen its head, not a branch to keep it company, nobody ever saw such a solitary thunderstruck, notwithstanding an eligible object. It is an effective conductor, and if the forest trees must be all converted into non electrics, why, ring them. We will lose more than can be gained, for without *the bush*, this colony would soon become a desert, as already and truly said, we do indeed require more evidence and facts; that paper was written for the express purpose of exciting attention.

I owe not much to school, less to college, but the great book of nature lies open before me, and I feebly endeavour to read or interpret some of her mystic works.

Allow a few sentences to my friend Mr. Shepherd, relative to his reply on the "Pastoral interest all right!" And first I render thanks, if they are of any value, to Mr. Sylvester for very correctly stating in Committee, that the aim of Mr. Meston was evidently intended to *invite discussion*. Perfectly right—and such ought to be the object of every paper read before the members. While Mr. Shepherd labours to prove that which the writer never doubted, yet finding many others sceptical, and in order to make business as plain as possible, he considered that the better way was manifest for the interest of the Society; to direct attention, and so afford the Committee an opportunity of explaining by Mr. Shepherd.

But why was not the concluding query answered? Looked it unworthy of notice in my friend's great mind? With permission be it recorded, that the question was one of no slight importance to the rural districts, namely, to fix a date from which the ages of sheep and cattle may be henceforth computed. Some of the Victorian Societies have lately taken the matter into consideration. Their decisions have not yet come to hand. There is no use in putting practical questions or of writing practical papers if they are only read, heard, shortly noticed, and then, as far as the members of Committee are concerned, finally shelved.

Rocky River,
August, 1858.

METEOROLOGICAL TABLE.

AUGUST, 1858.

OBSERVATORY, SYDNEY, LATITUDE 33·51 NORTH; LONGITUDE, 151·14 EAST.
HEIGHT ABOVE THE SEA, 145 FEET.

Day.	Barometer corrected to 32 deg. Frnht.		Wind.				Temperature		Cloud Extent.		Rain in Inches.	Remarks.
	Direction.				Force.		Max.	Min.				
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M.	9	9		
1	30.018	29·907	W.	W.N.W.	3	1	54·8	39·0	0	1		Fine; thick haze at sunset.
2	29·839	·741	W.N.W.	W.	1	4	56·6	39·6	9	0		Commenced blowing hard at 7
3	·761	·756	W.N.W.	N.W.	3	1	58·5	39·0	0	0		Fine throughout. [p.m.
4	·819	·792	W.N.W.	N.W.	2	2	59·7	38·3	2	9		2 p.m., rain squall from S.E.
5	·709	·623	W.S.W.	W.S.W.	2	3	55·2	42·1	10	7	·430	Showery all day.
6	·566	·653	W.S.W.	S.W.	5	4	55·4	43·6	4	10	·051	Light showers occasionally.
7	·830	·875	W.	N.	2	1	60·8	43·5	0	0	·083	Fine throughout.
8	·986	·965	W.N.W.	W.N.W.	2	1	59·5	39·6	0	0		Fine; heavy dew at night.
9	·980	·826	W.N.W.	N.E.	2	3	59·4	39·5	0	0		Fine; cirrus from W. at sunset
10	·743	·360	N.E.	N.E.	3	3	55·2	44·5	10	0	·064	Occasional showers, cleared at 8 p.m.
11	·323	·392	N.W.	W.N.W.	4	4	59·0	45·5	0	0	·093	Clear, strong wind, lessened at night.
12	·428	·489	W.N.W.	W.N.W.	5	5	59·2	46·1	2	10		Gale all day from W.N.W.
13	·522	·619	W.	W.	4	3	58·2	45·7	9	0		Wind lessening; fell at 10 p.m.
14	·703	·778	W.	W.	4	3	61·0	43·9	1	4		Showers from 4 to 9 p.m. [ly.
15	·829	·824	W.S.W.	W.	3	3	59·8	41·0	0	10	·066	A few drops of rain occasional-
16	·821	·848	W.S.W.	S.W.	4	3	10·0	44·0	1	8		Squall from S.S.W. 10 a.m.
17	·875	·866	W.	S.W.	3	3	58·2	40·6	0	0		Wind S. at 10 a.m.
18	·894	·802	W.	N.W.	2	1	61·1	39·4	0	5		Fine; clouded after sunset
19	·727	·541	N.W.	N.W.	1	3	62·1	39·1	10	1		Rain to W.; a few drops at 10 a.m. 8 p.m.
20	·645	·756	W.	W.N.W.	5	5	56·5	40·0	0	9		Bright and windy; clouded at
21	·733	·749	W.N.W.	N.N.W.	5	2	62·0	42·1	1	0		Bright and windy; wind fell at
22	·859	30·009	W.N.W.	W.	2	1	65·7	48·5	0	0		Very fine and warm. [night.
23	30·134	·061	W.N.W.	N.N.E.	2	1	66·5	36·1	0	0		Very fine and warm.
24	29·967	29·790	W.N.W.	W.N.W.	1	1	68·2	36·0	0	7		Very fine and warm.
25	·880	·971	W.S.W.	W.	3	1	59·4	43·3	1	0	·001	Light shower at 8 a.m.
26	30·065	·935	W.S.W.	E.N.E.	3	2	59·0	37·0	0	0		Fine; heavy dew at night.
27	29·999	·978	N.W.	W.	2	1	58·8	39·4	0	0		Fine; heavy dew at night.
28	·942	·773	N.W.	N.W.	1	2	62·3	40·7	0	1		Fine; cloudy from 5 to 8 p.m
29	·692	·625	N.W.	S.W.	2	2	70·0	46·1	10	5		Few drops of rain at 9 a.m.
30	·640	·555	W.N.W.	W.N.W.	3	3	63·7	47·8	10	5		
31	·708	·833	W.S.W.	W.	4	4	62·5	46·6	0	0		
Mean.	29·794	29·765			2·8	2·4	59·6	41·8	·25	·29	·788	Days Rain—9.

The thermometers and rain guage are on the Time Ball Tower, about sixty feet from the ground.
The extent of clouds is represented by the number of tenths of the whole sky, observed at the time of observation.
The force of the wind is represented according to the Observer's judgment, by numbers from 0 to 6, 0 representing a calm, and 6 a violent storm.

Registrar General's Office,
Sydney, 2nd September, 1858.

HEALTH OF SYDNEY.

The number of Deaths registered at the Central Office during the month of August is 94, viz.:—49 males and 45 females.

The number of Deaths registered during the corresponding month of last year was 97, and in 1856, 96.

The number of Births registered during August is 207, viz.:—101 males and 106 females, being 113 in excess of the Deaths.

TABLE SHEWING THE DEATHS OF MALES AND FEMALES REGISTERED IN EACH WARD, FROM 1ST TO 31ST AUGUST, 1858, DISTINGUISHING THOSE UNDER 5 YEARS.

WARD.	UNDER 5 YEARS.			ABOVE 5 YEARS.			GRAND TOTAL.
	Males.	Females.	TOTAL.	MALES.	Females.	Total.	
1.—Gipps	5	5	10	3	2	5	15
2.—Bourke*	1	6	7	7	2	9	16
3.—Brisbane	3	4	7	1	3	4	11
4.—Macquarie	4	...	4	4	1	5	9
5.—Cook	3	3	6	2	1	3	9
6.—Fitz Roy	1	5	6	3	4	7	13
7.—Phillip†	3	...	3	4	5	9	12
8.—Denison	3	2	5	2	2	4	9
TOTAL	23	25	48	26	20	46	94

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1ST TO 31ST AUGUST, 1858.

CAUSES OF DEATH.	Under 1 year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages
ZYMOTIC DISEASES. Endemic, Epidemic, and Contagious	5	3	1	1	2	12	1	...	...	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	16
SPORADIC DISEASES. *Of Uncertain Seat*,—Dropsy and other Diseases of variable Seat.	3	3	...	1	...	7	1	...	...	...	...	1	...	2	1	1	...	1	...	...	...	...	...	...	..	...	14
Of Nervous System.—Diseases of the Brain, &c.	7	1	2	1	1	12	2	1	1	...	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	19
Of Respiratory System.—Diseases of the Lungs, &c.	5	2	2	...	...	9	...	...	...	...	2	...	2	2	1	...	1	3	...	...	...	...	...	...	...	1	21
Of Circulatory System.—Disease of the Heart and Blood-vessels	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	1	3	1	...	1	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	7
Of Urinary Organs.—Diseases of the Kidneys, &c.	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1
Of Generative Organs.—Childbirth, Diseases of the Uterus	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	2
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Integumentary System.—Diseases of the Skin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
Old Age	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	...	2	..	...	...	...	...	5
External Causes.—Violence, Privation, and Intemperance	...	...	...	1	...	1	...	...	...	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	5
Unspecified	1	...	...	...	...	1	1	...	...	1	...	...	...	...	...	..	1	...	...	...	...	...	...	...	...	...	4
Total from all Causes	22	12	6	4	4	48	5	1	1	5	5	2	2	6	2	3	2	5	1	1	...	2	...	...	...	3	94

CHRIS. ROLLESTON, Registrar-General.

REMARKS ON THE GEOLOGICAL ORIGIN OF AUSTRALIA.

We have been favoured with the following interesting suggestions on the Geology of Australia, by a highly esteemed contributor, and shall be glad if the publication of them should tend to promote friendly discussion on this important topic.

1. Australia, the largest of islands, is also distinguished by its simple and symmetrical shape. It is surrounded on almost every side by the largest surfaces of undivided water, termed oceans, which the globe presents, and there is much in these very first circumstances to suggest the idea that the action of nature is here sluggish and unvaried. Now geology, which unfolds the history of the ancient throes and contortions of the earth's crust, is quite in harmony with this idea. In the Australian area nature's convulsions have been less frequent and violent than elsewhere, they have been slow but extensive, few but long-enduring. This may be argued from the simplicity of Australian geology; from the perpetual recurrence of the same rocks and marks of the same geological changes in every part of the continent. While in Europe and especially in England we find a long succession of different rocks and earthy strata within the distance of a hundred miles, or sometimes less, marking as many epochs in the ceaseless course of change, which begun when the earth was all a molten mass, and which is yet continuing, we find in Australia the marks of only a few such epochs. The intervening spaces of time must consequently have been longer and the effect of each period are proportionately enormous.

2. The geological epoch which principally, perhaps unhappily laid the foundations of Australia, was one corresponding pretty nearly to the carboniferous or coal-producing period of other parts. While many other large countries whose shape and features we can never more than vaguely guess, were covered by large forests and thick jungles of more than tropical exuberance, but of most peculiar character and appearance, the place where Australia now stands was, for the most part, a wide sandy sea-bottom. Some extensive beds of coal were, indeed, deposited and the primeval Australian forests which produced these differed then as now in their botanical features from other forests of the period. But the comparatively trifling strata of coal thus produced were overlaid by beds of sand and quartz pebbles of a thickness of several thousand feet,* and of a superficial extent scarcely less than the present extent of Australia. A few fish swam in these ancient seas, but the almost entire absence, as far as we have any means of judging, of animal and vegetable life is remarkable, but is perhaps to be accounted for, as elsewhere, by the want of carbonate of lime and by the abundance of iron. The latter produced in the sandstone the ferruginous concretion usually known as "ironstone."

3. Although it is not proved that the Australian sandstone is in every part of the same geological age, it appears to be nearly identical in mineral character, and in its association with iron. According to Sir T. Mitchell† six-sevenths of the surface of nineteen counties of New South Wales is formed of sandstone, and he also strikingly observes‡ that in one of his journies he left this rock in Sydney and it was the furthest rock he saw in the interior. Sandstone forms the massy flanks of the great Australian Cordillera, extending from the Gulf of Carpentaria to its apex in the Australian Alps, and thence into Tasmania. It forms the Grampians and other principal mountains of Victoria; it forms also the rectilinear ranges of Western Australia. It is well developed again on the North-west Coast,§ extending thence across the northern part of the continent in a somewhat elevated platform, as Mr. Juke's inferred, but as Mr. Gregory has more recently demonstrated by his explorations. In short *Australia is sandstone*, with exceptions now to be mentioned.

4. It is true that strata are to be found which were deposited at more ancient epochs than that of the carboniferous sandstone. Silurian rocks have been discovered by the Rev. W. B. Clarke, and are unmistakably identified in age with

* The thickness of the Sydney Sandstone is stated by Mr. Dana and Mr. Darwin at 800 or 1200 feet; surely in many parts at least, it is considerably greater.

† "Three Exped., etc., vol. ii. p. 328.

‡ Ibid, vol. ii. p. 357.

§ Grey, vol. i.

the Silurian rocks of the other side of the globe, by the character of their fossils. Metamorphic rocks, of the same or greater age, deposited in water, yet altered by the intense heat of the primeval earth, also occur in the interior parts of the Cordillera; with the slate, queiss, quartz, &c., of this system the gold is chiefly associated here as elsewhere. But unless Silurian or Devonian strata are hidden beneath the unbroken parts of the sandy covering, how comparatively small in superficial extent are all the rocks of greater age than the carboniferous sandstone.

5. As regards more recent geological epochs (secondary or tertiary) we find distinct marks of only a single one in the calcareous formation of Central Australia, which is referred, I believe, to the tertiary period. The great extent, the uniformity and continuity of this formation are most remarkable and fully bear out the remarks with which I commenced. For a distance of 500 miles around the Great Australian Bight, the coast presents a perpendicular wall of calcareous rock, formed in two strata, but so perfectly continuous that only two openings occur where a man can descend to the water's edge. The height only varies from about 300 to 600 feet. Tertiary lime stone also forms a wide flat bed limited to an elevation of 200 or 300 feet, surrounding the lower course of the River Murray. How uniform and unperturbed must have been the deposition and elevation of these strata. And between the time of their deposition and that of the Sydney sandstone what an immeasurably long period must have elapsed during which Australia was constantly above the sea level, and probably a barren flat surface as at present.

6. Yet perturbations have occurred, and in some parts the sedimentary strata have been elevated into mountains by the vast internal forces of the globe, and granite, the molten substratum of all, has protruded. This rock forms the interior *core* of the Cordillera, abutting on the coast about Port Curtis. It is largely developed in the Flinders Range of South Australia, and it fronts the coast for some hundreds of miles about King George's Sound.

7. Igneous and volcanic disturbances have also occurred; distinct marks of volcanoes are found in Australia Felix, and near Hanover Bay on the North-west Coast; Dr. Leichhardt also noticed *lava* on the North-east Coast. But basaltic or trap rocks rising through and disrupting the sandstone are the most common cause of the disturbance, as is seen at innumerable localities in New South Wales. Most of the remarkable mountain peaks such as Mount Hay, Tomah, Jellore, Warrawolong, Razorback are of trap rock. I think it is evident too that the peculiar forms of the long divaricating ranges, separated by deep gullies often bounded by perpendicular walls of sandstone, which so strongly characterise the Eastern part of New South Wales, especially in the Blue Mountains and Australian Alps, are due to the action, or, so to speak, the *under-running* of igneous rocks. Mitchell and Darwin have discussed the causes of this feature of the country. The former attributes the deep gullies to the action of water, and calculates* that 134 cubic miles of sandstone must have been excavated from the valley of the Cox River alone and discharged through a gorge 2200 yards wide. Darwin† considers this explanation, as it is, impossible; the action of the sea could not excavate a valley, for its chief force would be spent on the exterior cliffs of the gorge, just as at the Heads of Port Jackson. And I surely think no one would seriously maintain that the *scored* surface of New South Wales was produced either under the sea, or by the running of rain water. Darwin proposes a very original theory, viz., that the sudden rise of the Blue Mountains at Lapstone Hill forms a *natural escarpement*, that is to say that a great sand-bank was originally deposited in that shape. This may be reasonable, but when he also states his opinion that the deep precipitous gullies were excavated by currents before the rock was consolidated, I am unable to agree. The perpendicular cliffs of the Grose and Cox vallies forbid this theory, but render probable his own suggestion which he immediately afterwards discards, that the vallies are areas which have sunk beneath their former level. It comes to much the same thing to suppose that trap rocks have elevated or *under-run* the ranges, and considering the numerous

* Three Expeds., &c., vol. ii. pp. 357-8.

† Geological Works, part ii.

eruptions of such rocks, this explanation seems highly probable. I do not know whether the *tiers* or ranges of igneous rock (greenstone) in Tasmania will lend any support to this theory.

8. This peculiar disturbance of the sandstone strata* recurs in a precisely similar manner on the North-west Coast, 2000 miles away. It is then impossible to deny that even the more violent agitations of nature have, in the Australian area, a certain systematic and uniform extension.

9. The post-tertiary and alluvial formations will equally, perhaps most emphatically, bear out my position. I allude to the vast sandy plains of the interior traversed by Sturt; to the expanses of loose sand, soil, or mud deposit, described by Mitchell† as forming the districts of the Darling, Bogan, and other connected rivers; to the unexplored plains of North-western Australia, only protected from the inroads of the sea by lines of low coast dunes‡; and to the shores of the Gulf of Carpentaria, so low and level, so utterly destitute of any hill or rise that a mangrove shore is alone visible from a vessel. In reading accounts of such country one is sufficiently convinced that the ocean alone could have levelled these plains, which have since remained undisturbed except by a gentle elevation acting in a uniform manner over the whole of Australia, and limited in some parts to a few feet.

10. I have even yet to mention the calcareous beds of very late geological age which lie along the southern and western shores of Australia for many hundred miles; they are almost invariable throughout in nature and height, and are only to be compared, according to Mr. Darwin,§ to the great coral formations of the present day, although he says they are not actually formed of coral. And thus I am led to notice the fact that the most vast, uniform, and continuous of all coral reefs is that which reposes on the North-eastern Coast of Australia—emphatically the *Great Barrier Reef.*

11. I have briefly shown how few were the former geological convulsions of the Australian area; how simple, but extensive were the stratified rocks formed during certain periods, when the area was beneath the waters of a former ocean to the *last passage* in geological history, namely, that final elevation of a continent above the sea, by which its present outline was determined, I now refer. It is a general remark, that Australia is comparatively a recent country. That the elevation of the Port Phillip country is even now proceeding, is proved by the most tangible evidence, namely, that the hills and banks stand higher out of the water than they did at the settlement of the colony. This was noticed some time since by Mr. Latrobe and Dr. Lang,* and the continued rise is recorded in a paper very lately read before the Philosophical Society of Victoria.

12. The south-easterly coasts of Australia have also been upraised at a period comparatively recent, as several writers have remarked. Mitchell observes† that the North and South Heads of Port Jackson, Baranjuey (South Head of Broken Bay), the Nobbies at Newcastle, Cape Islander, the Rock at Wollongong, &c., have all formerly been islands, connected with the mainland by a low sandy neck. Brisbane Water, Tuggerah Lake, and a great number of swamps and lagoons along the coast also bear evidence, more or less distinct, to the same point. Again, great beds of oysters, generally raised some five or six feet above high water mark, are found in most or all the inlets of the coast, as, for instance, in Hunter's River, Broken Bay, Cook's River, Port Hacking, &c. In the swamp which lies between the Cook's River and Botany Roads, near Sydney, I have noticed the former shore limits of these beds well exposed by the cutting of a trench along a road which crosses the swamp. The shell-bed thins out as it abuts up the higher land, and there yet remain very distinct ridges, as if produced by waves, but now covered by earth.

13. Even as far south as Tasmania, we have proofs of the same or even a greater elevating action. Thus "both the eastern and western shores of the Bay, in the neighbourhood of Hobart Town, are in most parts covered, to the height of 30

* Grey, vol i.
† Tropical Australia, p. 114.
‡ King, vol. i. p. 32.
§ Geological Works, part ii. pp. 147-8.

* Phillip's Land, p. 104.
† Two Expeds. vol. ii. p. 374.

feet above the level of high water mark, with broken shells mingled with pebbles."* In the vicinity of Bass's Straits, Count Stizelechi† saw distinct elevated beaches containing fossil shells, especially oysters. At Lake King, in Gipp's Land, there is a beach elevated 70 feet above the sea; at Green Island, in Bass's Straits, and ten miles south of Cape Grimm, on the west coast of Tasmania, beaches occur at the height of 100 feet. On the South Coast of Victoria also, between Cape Liptrap and Portland Bay, are elevated beaches containing oysters identical with existing species.

14. As regards Port Jackson I am able to add a fresh proof of the last elevation the land, more vague perhaps than a raised beach, but still interesting. In many parts of the shores of this Harbour a careful observer will discover lines of protruding but low cliffs or overhanging rocks, the base of which preserves a pretty constant elevation of about 40 feet above high water mark. It is true that where the shores are very rocky and steep, these particular rocks cannot be distinguished, but in certain parts about Black Wattle Swamp, Glebe Point, Johnstone's Bay, &c., they are unmistakeable. At the western-most point of Pyrmont they form a small escarpement, and along a creek which descends from Camperdown, into Johnstone's Bay they are very striking, and run along the opposite shores in a parallel manner for a considerable distance. They may be traced also in some parts of Sydney, between George-street and Darling Harbour. The remarbable flats of Rushcutter's Bay, Double Bay, Rose Bay, Manly Beach, &c., are connected in origin with these 40-feet cliffs.

15. There is also evidence that the sea-water formerly stood in Port Jackson at a much greater height, probably 130 to 150 feet above its present level. This is attested by lines of large protruding and overhanging rocks in the neighbourhood of Rose Bay, Bondi Bay, Coogee Bay, &c., and by a very well marked escarpement, which cannot escape notice, on George's Head, beneath which the 40-feet cliffs may also be traced. More exact and indisputable evidence to the same effect is afforded by a small shell bed, which was discovered on the east side of Mossman's Bay, and kindly pointed out to me by the Rev. W. B. Clarke; he had ascertained its height to be, if I remember aright, 110 feet above the sea level.

16. The recent elevation of the North and North-west Coasts of Australia is not proved, so far as I know, by any distinct fact; it is only inferred from their very low, flat, alluvial nature. In some places they are yet subject to overflow by the sea on rare occasions. The rise of the North-east Coast is a very debatable and interesting question. It is probable, besause both in the Gulf of Carpentaria to the north and at Port Jackson to the south a rise of land is proved or inferred. Further, Captain Stokes says,* "I found (near Cape Upstart) a flat nearly a quarter of a mile broad, in a quiet sheltered cove, within the Cape, thickly strewed with dead coral, forming, in fact, a perfect beach of 12 feet above high water mark." At least no depression of the land can have taken place since the formation of these beaches.

17. The argument against the rise of the North-east Coast is simply that it is subversive of Mr. Darwin's beautiful and universally received theory of coral reefs, which explains the enormous depths to which they extend by the slow depression of the sea bottom, combined with an equivalent upward growth of the coral reefs based upon it. Coral insects are supposed not to live in a greater depth of water than 20 or 30 fathoms, and the various forms of coral islands or *atolls* and barrier reefs rising from immeasurable ocean depths can, therefore, only be produced in the manner described. Now the barrier reef of Australia is the greatest and most wonderful of its kind, and rises from *out of soundings* on the east side.† The North-east Coast of Australia must, therefore, have subsided through an immense vertical extent, unless we suppose that the great reef is in reality only a fringing or incipient reef, resting on the edge of a submarine table land. This is a very interesting and difficult point for future

* Darwin's Geol. Works, part ii. p. 140.
† Physical Acct. of N. S. Wales, p. 143.

* Stokes, vol. i. p. 332. See also Mr. Stutchbury's 16th Roport on Geology of N. S. Wales, Nov., 1855. Mr. Beet Jukes' Voyage of H.M.S. Fly, vol. i. p. 335.
† Flinders, vol ii. p. 103.

investigation; Mr. Darwin seems to have left it an open question.

18. In the level tract of country included within Lake Torrens are "interspersed in various directions, many small flat-topped elevations, varying in height from 50 to 300 feet, and almost invariably exhibiting precipitous banks. These elevations are composed almost wholly of a chalky substance coated over on the surface by stones, or a sandy soil, and present the appearance of having found a table land that has been crushed to pieces by the violent action of water."† It seems a very probable suggestion that these strange elevations are upraised coral reefs, resembling those *fringing reefs* which form in shallow waters, such as those of the Persian Gulf. They may be connected in origin, too, with the *calcareous superstratum* so abundantly found by Captains Flinders and Baudin on the granite rocks of Spencer's Gulf and elsewhere. The limits of latitude do not forbid us to suppose that the whole are of coral origin.

19. What facts I have here collected concerning the elevation of the Australian continent are sufficient to show that it is an interesting subject for further enquiry. Has the elevation been uniform, or does it increase gradually from north to south? Numerous and very important points in the physical geography of Australia are connected with this subject. Much light will be thrown upon the nature of Lake Torrens; upon the peculiarities of the internal river system of New South Wales, such as the *bergs* and outer banks of the Murray and other rivers, and the great flat basin of clay in which the Macquarie, Namoi, Barwan, Balonne, &c., lose themselves, but unite to form the Darling. Are the many anomalies of these rivers in any way to be attributed to their recent formation as many have asserted, from Humboldt downwards, or may they not be fully explained as the permanent effects of the climate and shape of the continent? The "Devil-Devil" land which exhibits natural furrows like plough-marks, and which occurs in many parts of the colony must also be a connected alluvial effect.

20. Australia, as I first remarked, may be called the largest of islands or the most solated and sea-surrounded of continents. Simple in shape, we find it in geological formation a mere sheet of sandstone ("a world of stone quarries and sterility," Sir T. Mitchell), quite flat towards the centre, with its edges somewhat disturbed and raised by cosmical forces into mountain ranges of remarkable length and continuity, but of unpretending elevation. Its simplicity in these points produces that absence of variety which, in relation to the human mind, is termed *monotony*. But lately, in a geological sense, it is evident that its place was filled by a shallow, perhaps, a coral fringed sea, surrounded by a somewhat semi-circular string of islands. Upon these, we may infer that the Diprotoda and other extinct animals of Australia lived, since the banks of the rivers Macquarie and Condamine, in which their scattered bones occur, are much elevated. And while the singularity of the fauna and flora of this land point to the fact that it has perhaps always been isolated as at present; its botanical geography, and perhaps even its ethnology, should be studied in connection with the idea of its former disconnected condition. The last geological changes, or what we may term the *surface geology* of Australia, form a problem of intense interest.

† Mr. Eyre; Official Report, Oct. 1840; or *Eyre*, vol 1. p. 176.

EARTHQUAKES IN NEW SOUTH WALES.

June 1778.—Colonel Collins (Account of N. S. Wales) says, "One evening in this month (June), a slight shock of an earthquake had been observed, which lasted two or three seconds, and was accompanied with a distant noise like the report of cannon coming from the southward; the shock, however, was local." In a chronological table are found the following:—June 22nd, "Shock of an earthquake felt at 11 a.m., followed by a sulphureous vapour from the earth, for a considerable time after the undulation had ceased."

1801. January 17th.—Earthquake felt at Sydney.

1804. May 7th.—Earthquake felt at Parramatta, Prospect, and the Hawkesbury.

1806. September 24th.—Earthquake strongly felt at Richmond Hill.

1823. November 28th.—Earthquake at Port Dalrymple, Launceston, V.D.L.

1828.—N. S. Wales.—A very severe earthquake, lasting 25 minutes, followed by a destructive tempest; neither exact date nor locality given.

1829. (Catalogue Trans. Brit. Assoc., 1854, 210).—Night between 31st August and 1st September, New South Wales, a violent earthquake, during a dreadful tempest. The earth was raised up in waves like the sea, forming in many places terrible fissures.—*Asiatic Journal.* The true description of this earthquake is as follows:—"Several smart shocks were felt amongst some of the mountain ranges distributed over the district of Argyleshire, somewhere about 25 miles from Lake George." It was accompanied by a severe squall and storm of wind from the south-west.

The following extraordinary account is extracted from the splendid catalogue of earthquakes recently compiled for the British Association (Trans. 1854.) I is difficult to understand how such an exaggeration of the facts became current.

1837.—September 22, 3 a.m. "Lasaya, in V.D.L., extended also to Ureya, on the coast of New Holland. (Where are these places situated?) Violent and disastrous earthquake which continued until dawn. The sea made inroads upon the shore, and a new island was formed." It is also stated that terrible explosions were heard, bright streaks of red were seen in the sky, and Lasaya and Ureya were thrown down and filled with corpses. (Mr. Perry's Memoir on Earthquakes in the Basin of of the Rhine, p. 94.)

The following account is, I believe, the truthful one:—A slight shock of earthquake was very perceptibly felt in various parts of Sydney on the night of the 2nd (August). At Newcastle, (August 2nd, 1837), 20 minutes past 10 at night, a considerable earthquake was felt, with the usual accompaniment. Men at work in the coal-mines, 23 fathoms below the surface of the earth, did not perceive, it although above ground, and especially in the higher parts of the country they could not have failed to notice it. The preceding day was sultry, and an extraordinary redness in the sky, like that which appeared on more than one night in the month of April last, was noticed not many evenings before.—(*Sydney Herald*, August, 1837.)

1842. October 28th.—An earthquake occurred this day which was felt more or less in most parts of New South Wales. Slightly in Parramatta, more distinctly at Windsor, and violently at Newcastle, Port Stephens, and Port Macquarie. At Sydney nothing was noticed. Many people awoke in their beds by the shaking of walls and furniture, the earthquake happening at half-past 5 in the morning. At Port Macquarie it lasted three minutes, and seemed to proceed from N.W. to S.E. The mercury in the barometer oscillated violently. The district of the Hunter has several times been visited by shocks, but such a severe and extensive one as the present had never perhaps been known.

PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

October 13th.—Twenty-first Monthly Meeting of the Philosophical Society of New South Wales, held in the Exchange. The Rev. W. B. Clarke, in the Chair.

The Chairman announced to the members that at the last Council Meeting it was arranged that after the necessary business shall have been transacted at the Meeting of the 8th of December next, the remainder of the Evening will be devoted to a Photographic conversazione.

This notice was given with the view to induce members to bring forward Photographic contributions.

The following gentlemen were duly elected ordinary members, viz:—

Alexander Dick, Esq.
John Lucas, Esq.

One new candidate was proposed and seconded.

The following Papers were then read, viz.:—

1st. "On the construction of Dams," by Professor Pell.

2nd. "On Currency and Banking in New South Wales," by Edward R. Drury, Esq.

After some conversation on the subject of these Papers, the meeting adjourned until Wednesday, the 10th of November.

ON THE CONSTRUCTION OF DAMS.

By M. B. PELL, Esq., B.A.

It is the object of the following paper to determine the form of the section of a dam, under which the greatest stability

may be secured with the least possible quantity of materials. The problem presents itself under two aspects—

(1.) To find the form under which the greatest height may be obtained with a given quantity of materials.

(2.) To find the form so that a required height may be obtained with the least possible quantity of materials.

The solution of this problem involves some rather intricate analysis, but the results are extremely simple and easy of application, and seem to be of considerable practical importance.

Whatever be the form of the face of a dam, the horizontal pressure of the water upon it will vary as the square of the depth. The horizontal pressure will of course be the greatest when the reservoir is full, and in that case will vary as the square of the altitude of the dam. The moment or tendency of this pressure to turn the dam over, will therefore vary as the cube of the altitude. The form of the section of the dam should be such that the moment of its weight, counteracting the pressure of the water, may vary in the same proportion. The section should therefore be triangular, for with that form alone is this condition exactly secured. It remains then to be determined, what is the most advantageous form of the triangle.

In the first place let us suppose the quantity of materials, or in other words, the area of the section of the dam to be given.

Let A B C be the section.

2 area of A B C $= c^2$,

A B the face of the dam; B C its base; A O perpendicular to B C; B D $= \frac{1}{5}$ B A; D K horizontal; G and H the middle points of E D and E K. P the horizontal pressure upon A B, and Q the vertical pressure. W the weight of A O B, and V that of A O C.

D is the centre of pressure of A B, and G and H are the centres of gravity of A O B and A O C respectively.

Let ρ be the specific gravity of water.

σ . . . . . of the material of which the dam is constructed.

The tendency of the pressure P is to turn the dam about the point C, and this tendency should be counteracted by the weights W and V and the pressure Q. As there would obviously be little practical advantage in learning the form of a dam which would only just stand, we will suppose the moments of the forces which prevent the dam from turning over to be s times as great as that of the pressure P, so that s may be called the strength of the dam.

Let O B $= x$, O C $= y$, O A $= z$:

then $$z(x+y) = c^2 \qquad (1)$$

The moment of P about C $= \frac{1}{3} z$ P

. . . . . Q . . $= (y + \frac{2}{3}x)$ Q

. . . . . W . . $= (y + \frac{1}{3}x)$ W

. . . . . V . . $= \frac{2}{3} y$ V

$$\therefore \tfrac{1}{3} s z \mathrm{P} = (y + \tfrac{2}{3}x)\mathrm{Q} + (y + \tfrac{1}{3}x)\mathrm{W} + \tfrac{2}{3} y \mathrm{V} \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Now $$\mathrm{P} = \tfrac{1}{2}\rho z^2$$
$$\mathrm{Q} = \tfrac{1}{2}\rho xz$$
$$\mathrm{W} = \tfrac{1}{2}\sigma xz$$
$$\mathrm{V} = \tfrac{1}{2}\sigma yz$$

Substituting in (Q) we have

$$\tfrac{1}{6} s\rho z^3 = \tfrac{1}{2}\rho xz(y + \tfrac{2}{3}x) + \tfrac{1}{2}\sigma xz(y + \tfrac{1}{3}x) + \tfrac{1}{3}\sigma y^2 z$$

Dividing by ρz and reducing,

$$sz^2 = x(2y + 2x) + \frac{\sigma}{\rho}x(3y + x) + \frac{2\sigma}{\rho}y^2$$

Let $\frac{\sigma}{\rho} = r$ then

$$sz^2 = x(3y + 2x) + rx(3y + x) + 2ry^2$$

or $$sz^2 = (r+2)x^2 + 3(r+1)xy + 2ry^2 \quad (3)$$

z is therefore a function of x and y, which are subject to the condition (1)

Differentiating (1) and (3) with respect to x we obtain the equations

$$\frac{dz}{dx}(x+y) + z\left(1 + \frac{dy}{dx}\right) = 0$$

$$2sz\frac{dz}{dx} = 2(r+2)x + 3(r+1)\left(y + x\frac{dy}{dx}\right) + 4ry\frac{dy}{dx}$$

If z be a maximum, $\frac{dz}{dx} = o$ and these equations become

$$1 + \frac{dy}{dx} = 0$$

$$2(r+2)x + 3(r+1)(y + x\frac{dy}{dx}) + 4ry\frac{dy}{dx} = 0$$

Therefore

$$\frac{dy}{dx} = -1$$

and $2(r+2)x + 3(r+1)(y-x) - 4ry = 0$

or $(1-r)\,x + (3-r)\,y = 0$

Therefore $\frac{x}{y} = \frac{3-r}{r-1}$ . . . . (A)

Substituting in (3)

$$s\,z^2\,(r-1)^2 = \left\{ \begin{array}{l} (r+2)\,(3-r)^2 \\ +\,3\,(r+1)\,(r-1)\,(3-r) \end{array} \right.$$

$$2r\,(r-1)^2 \left\{ y^2 = (r^2 + 2r + 9)y^2. \right.$$

From (A) $\frac{x+y}{y} \quad \frac{2}{r-1}$

Therefore $4sz^2 = (r^2 + 2r + 9)\,(x+y)^2$

From (1) $= \frac{c^2}{z^2}\,(r^2 + 2r + 9)$

Therefore $z^4 = c^4 . \frac{r^2 + 2r + 9}{4\,s}$

and $z = c . \sqrt[4]{\frac{r^2 + 2r + 9}{4\,s}}$ (B)

Let $x + y = b$, then from (1)

$$b = \frac{c^2}{z} \quad . \quad . \quad . \quad . \quad . \quad (C)$$

From (A) $x = \frac{b}{2}\,(3-r)$ . . (D)

$$y = \frac{b}{2}\,(r-1) \quad . \quad . \quad (E)$$

(B) Gives the altitude of the dam.
(C) . . base . . . .
(D) and (E) Give the segments of the base.

If z be given, equation (B) will determine c, and the remaining equations may be applied as before.

The angles B A O and C A O may be determined as follows—

Let B A O $= \beta$
„ C A O $= \gamma$

Then $\tan \beta = \frac{O\,B}{O\,A} = \frac{x}{z}$

$$= \frac{b}{2z}\,(3-r)$$

$$= \frac{c^2}{2z^2}\,(3-r)$$

$$= \frac{3-r}{2} \sqrt{\frac{4\,s}{r^2 + 2r + 9}}$$

Therefore $\tan \beta$

$$= (3-r) \sqrt{\frac{s}{r^2 + 2r + 9}}; \quad . \quad (F)$$

and similarly $\tan \gamma$

$$= (r-1) \sqrt{\frac{s}{r^2 + 2r + 9}}. \quad . \quad (G)$$

It is observable that these formulas for β and γ are independent of the magnitude of the dam, depending upon s and r only; that is upon the weight of the material made use of, and upon the required strength of the dam.

If $r = 3$, or if the material be three times as heavy as water, we have

$$x = o,\ y = b,\ \tan \beta = 0$$

or the face of the dam vertical.

If $r = 1$, or the material of the same weight as water, thus

$$x = b,\ y = o,\ \tan \gamma = o$$

or the back of the dam is vertical.

If r be greater than 3, then x becomes negative, which makes the face of the dam lean forward. For no material however, which is likely to be used in the construction of dams is r so great as this.

For the common sandstone of this country $r = \frac{81}{31}$. This gives

$$\frac{x}{y} = \frac{6}{25}$$

$$x = \frac{6}{31}.b$$

$$y = \frac{25}{31}.b$$

or the segments of the base in the ratio of 6 to 25.

ESSAY ON CURRENCY AND BANKING IN NEW SOUTH WALES.

ERE I proceed to the consideration of the subjects which I propose to examine in this paper, I would claim your permission to remark, that in preparing it I have been simply governed by a desire to discharge to the best of my feeble ability, what I conceive to be the duty of every member of this society, whose pursuits or studies may possibly enable him to add a mite to the sum total of the public knowledge.

To establish the currency on sound and safe principles, which shall admit of its expansion as the requirements of the community augment, in obedience to laws which reason and experience have proved to be unerring in their operation,—

and to promote a sure and stable system of banking, which shall mould and adapt itself to the wants of the country, growing with its growth, and affording to the public as much security as can be expected of human institutions, are questions the importance of which can scarcely be over estimated, inasmuch as they involve the interests not only of the present, but of future generations. Few subjects require to be approached more calmly and dispassionately, or call for a more careful and searching investigation, since history every where warns us that the adoption of false principles must inevitably result in calamity and ruin.

We are, I think, too apt, more especially in matters of political economy, to follow blindly in the track of the mother country, and to pin our faith to the speculative views expressed by eminent statesmen and writers in the other hemisphere. Far be it for me to say that we ought not to treat such opinions with respect, but when we see names of equal celebrity ranged on opposite sides; when we behold great authorities supporting different views and promulgating antagonistic theories, we should hesitate to adopt any system which had not satisfied the tests of time and experience, unless it could be proved beyond all doubt that such a system was in perfect accordance with natural and immutable laws.

The application of the principle of free competition to Banking is considered by many writers to be dangerous in the extreme. Even amongst those who strenously laboured to remove all restrictions from commerce, not a few have judged it necessary to withhold from Banking institutions that liberty which was demanded for all other departments of trade. The banking catastrophes which have desolated the United States are continually held up as the consequences of unlimited competition. It is true that they furnish solemn and instructive lessons, but to infer that restraint should be imposed on banking institutions, because disasters have arisen where there was no restriction, is manifestly incorrect, unless it can be shown that free competition caused the disasters, and that legislative intervention can prevent them from occurring. I shall however, I trust be presently able to show that the Banking catastrophes in America, were mainly to be attributed to Legislative interference.

It has been well said by a writer on the "Currency Question,"—"that the laws which regulate the production and distribution of wealth are based in nature and universal in their operation, whilst money and banking being merely instruments for facilitating production and distribution are as thoroughly subject to the same laws as the motions of a satellite are to those of the principal planet." Free trade or unrestricted competition is the practical recognition of the great fundamental law of supply and demand, and there can be no philosophical ground for withholding its application from Banking rather than from any other branch of trade.

It may be that of all the commercial misfortunes which can befall a nation, there are few more terrible than those occasioned by what is termed a Banking mania, or the rapid and undue multiplication of banking institutions, and it is generally believed that free competition has a tendency to encourage and aggravate this danger. Experience however, teaches the reverse, as I shall prove by referring to the annals of Banking in Scotland.

In my humble judgment the greatest amount of security which can be afforded to the public by banking institutions, is furnished by free competition. Upwards of one hundred years ago, Quesnay, who has been justly called "the Copernicus of Political Economy" gave utterance to the following maxim: "Qu'on maintienne l'entiere liberté de commerce; car la police du commerce interieur et exterieur la plus sure, la plus exacte, la plus profitable à la nation et á l'état, consiste dans la pleine liberté de la concurrence." Every country which aspires to commercial eminence and prosperity should have this maxim inscribed in letters of gold on its Halls of Commerce. In England the Legislature has constantly interfered with the free action of monetary institutions. Were the British people to learn the cost of this continual inter-meddling, it would stand aghast. And what has been the result? Why in the middle of the nineteenth century, England is still making experiments. The Bank Act of 1844, is nothing but an experiment, and when we see that this Act is suspended whenever a commercial crisis arises, because it is confessed that to carry out its principles *then* would entail national bankruptcy, I think we may safely conclude that this experiment will not be a final one. The currency question, that *quæstio vexata*, which according to a modern statesman has made as many lunatics as love, is not yet solved or likely to be so until the British legislature recognises the truth in reference to Currency and Banking, of what was advanced by that gifted warrior, statesman and philosopher, Sir Walter Raleigh, when he wrote: "A statesman may do much for commerce, most by leaving it alone. A river never flows so smoothly, as when it follows its own course, without aid or check. Let it make its own bed; it will do so better that you."

The different results which have ensued when Legislative intervention was unknown, have been so well described by Mr. Wilson, in his excellent work on "Capital, Currency, and Banking," that I shall be pardoned for extracting the passage in which he compares the Scotch with the English system of Banking. He says, (page 98)—

"In contrasting the experience of the two countries, it would be impossible in the whole history of commerce to find such striking examples of the beneficial effects of perfect freedom of action on the one hand, unaccompanied by any privileges or monopolies to any one party, but in which all are exposed equally to free and unrestricted competition, and the wholesome influence of public opinion; and, on the other hand, the evil effects of privileges and monopolies granted to favoured parties, and of the attempt to regulate by Acts of Parliament questions of commerce and currency. In the case of Scotland we have seen for nearly two centuries the effect of a perfectly free and uncontrolled competition. Not one act or law has been passed during the whole of that time to interfere with or regulate the currency of that country. The effect of free competition has been to assimilate and mould the system of business to the wants of the age, and to the habits of commerce as they changed. Hence, competition and free action have maintained the Scotch banks exactly what the Scotch public and their necessities required; and hence the universal satisfaction which has all along marked the system. But does free competition produce unsound banks or unsound banking? On the contrary, the soundness of the Scotch banks is the necessary offspring of that free competition. The first essential in a Bank is safety; the first thing therefore, which a Bank must study in competing for business, and to attract valuable customers, is the perfect confidence of the public; competition, therefore, directs immediately to the adoption of such safe and perfect principles as shall secure that great essential confidence. There being no restriction

as to number of partners, one of the oldest elements of security of Scotch banks was, that they always consisted of a large number of known and wealthy men, even before the introduction of the Joint Stock Banks. By *law*, there has never been any restriction against *any* one issuing notes in Scotland; by *practice*, it has ever been impossible for any unsound or unsafe paper to obtain currency. The late Mr. Maberly, when in the height of his prosperity, notwithstanding all his influence, laboured for years in vain to establish a circulation of his notes, and public opinion, with free competition, was his only check."

"What has been the case in England during the same time? We started by giving privileges to the Bank of England: these privileges alone were enough to prevent safe banking from ever gaining ground. We prescribed and limited the number of partners which could bring their joint security to the public in any one Bank (a direct premium for insecurity). We prohibited the establishment of banks of issue within that circle, where alone strong and safe establishments would have been most likely to have taken root, and extended their influence upon safe principles throughout the country, as was the case from Edinburgh throughout Scotland. And we interfered by numerous regulations to protect the privileges of the Bank of England, and effectually prevented all that wholesome action of public opinion and free competition which have proved so beneficial in Scotland. We have never rested for many years together without some new laws, some new regulations, dictated by the fancy and theory, fashionable at particular periods. And thus, by constant interference, we have prevented public opinion, and the experience of bankers themselves, adopting and moulding their business to the best and safest course, even under any given state of circumstances. It has been a system of constant interference and disturbance accompanied only by disappointment—and doomed to disturbance again. But disappointment has produced no lack of confidence in legislators; and Sir Robert Peel proceeds to a new experiment in 1844, with as much confidence as if those of 1819—1826, and the subsequent acts, had all been as successful, as they have proved the contrary. And what is more, disappointment in former numerous experiments seems to make him so confident in this new one, that he insists upon dragging with him the Scotch banks, who for a couple of centuries have neither disappointed themselves nor the public."

"The principles of currency have certainly been rendered so abstract and intricate by these various and numerous theories, that few people will venture an effort to understand them. Though in reality, if left alone, and released from the eternal interference of law-makers, and from the baneful influence of monopolies, they are as simple and self adjusting under free competition as the conduct of any other business whatever. The affectation of governments to protect and find prudence for the public in such matters, is proved by all experience to be a practical cheat and delusion, and which has always had its origin in an attempt to support and maintain some monopoly or privileged class."

I must confess that it seems to me utterly impossible after examination of the foregoing statements, the truth of which has never been controverted, to arrive at any conclusion which is not immeasurably in favour of free competition, and thoroughly condemnatory of government interference. There is a fact also mentioned above, to which I beg to call your particular attention, as it furnishes an unanswerable argument against those who pretend that under a system of free competition, the power of issuing notes is invariably abused. I allude to the statement that whilst by *law* there was no restriction against any one issuing notes in Scotland, by *practice* it was ever found impossible for any unsound or unsafe paper to obtain currency. When I add on the same authority, that—"it appears in parliamentary evidence in 1826, that from the first establishment of Banks in Scotland until that time—a period of nearly one hundred and fifty years—the whole loss which the public had sustained by Scotch banks and by the free and unlimited competition in the issues of notes, was £32,000, or little more than *one-tenth* of the loss in England by the wear and tear of coin alone during twenty-seven years." I think it will be admitted that the system of competing issues may fairly be assumed to be a sound and safe one.

I may here observe however, that one Act of Parliament in reference to the Scotch currency was passed in the year 1765. It prohibited the issue of notes of a lower denomination than £1, and forbade the insertion of what was known as the optional clause, by which bank-notes were made payable on demand, or at a future date, at the option of the issuers. Mr. Wilson has overlooked this apparently. The Bank of Scotland commenced issuing £1 notes in 1704, and with the exception above mentioned no act of the Legislature interfered with the issues of the banks till 1845. The experience of banking in Scotland also completely refutes the notion that under a system of free competition the number of banks increases rapidly. In the year 1826, there were 32 banks of issue in Scotland, but in 1846, only 18 were in existence, although a vastly greater amount of business was transacted by these. The paid-up capital of the 18 banks amounted to £11,912,130, giving an average to each bank of £661,785, and the number of partners was 14,235. There were at that time 99 Joint Stock Banks in England with a paid-up capital of £14,000,000, making an average to each bank of about £140,000. There were also 184 private country banks in England, issuing notes, their capital was unknown, as well as that of a host of non-issuing private bankers.

It appears to me that from these facts we may safely infer that the tendency of unlimited competition is to create few, but large and powerful institutions, and not to inundate a country with a flood of beggarly bankers.

As there are some however, who admit that free competition in banking is both desirable and beneficial, but who nevertheless would deprive the banks in this Colony of the power of issuing notes; I shall now proceed to examine the principles which those who denounce the system of competing issues as fraught with danger, advocate as a panacea for evils which they must confess do not exist as yet, but only "loom in the future," in the appalling shape of phantom crowds besieging visionary banks, and vainly demanding gold in exchange for notes!

In the year 1852, a select Committee of the Legislative Council was appointed to inquire into and report upon the state of Currency and Banking in this Colony. No evidence was taken as the Committee conceived that the "speculative opinions" of Sydney merchants and bankers were unworthy of consideration. The report condemned the practice of issuing notes pursued by the banks as unsound and dangerous, and strongly recommended the creation of a sole or National Bank of Issue. I may mention that the note-circulation then amounted to £494,450, and coin and bullion to £686,510, whilst in the following year the circulation rose to £801,943, and the coin and bullion to £2,303,862, from which it certainly does

not appear that the convertibility of the notes was in peril.

There is a remarkable circumstance in connection with this report, namely that charters were shortly afterwards granted to several new Banks of *Issue* and Deposit, some of which have since established themselves in the Colony. I say remarkable, because it shows that neither the Colonial nor Home government endorsed the views of the Committee, and also because it may be fairly inferred from their concession of the power of issuing notes, that they saw no danger, or prospect of its abuse. It demonstrates therefore how little faith must be placed in the principles of the famous Bank Act of 1844, which, it is well known provided for the gradual absorption of country bank issues, by the Issue Department of the Bank of England, which in the course of time is intended to become the sole issuer of notes in England. It certainly appears passing strange and not a little inconsistent that the Imperial authorities should grant charters to English companies, expressly permitting them to issue their notes in the Colonies, when it is considered too dangerous to allow such a practice in England, and they are strictly prohibited from doing so there. If the principle is vicious, it must be so every where, but on the whole, I opine, we have reason to be thankful that our currency has not been singled as a subject for Imperial experiments. Henceforth the danger will be from within. Indeed, the policy of establishing sole Banks of Issue in New South Wales and Victoria has recently been advocated, and a paragraph in the Governor-General's speech at the opening of Parliament this year, announced that some scheme would be brought forward by the Government for the creation of an institution which should monopolize the power of issuing notes, at this time enjoyed by the various Banking Companies established in the country.

It is not my intention to examine the different plans which have been proposed, either in England, or in the Colonies; not only because the limits of this paper will not permit of so enlarged a discussion; but also because it is unnecessary in a consideration of the general principles which it is sought to introduce.

These principles have been so well set forth by Lord Overstone in his Evidence given before the select Committee of the House of Commons of 1857, on Bank Acts, that I cannot do better than extract the following statement of his opinions; with which, those expressed by the advocates of a Sole Bank of Issue in this Colony, will, I think, be found to coincide.

His Lordship says,

"First—The supply of the current coin, that is, the money of the realm, ought to be entirely separated from banking business, which is simply trading in money, borrowing at a low rate and lending at a higher rate."

"Second—Bank notes should be treated as tokens or representatives of the current coins, that is of the metallic money of the country. A £5 note is, in fact, a token or certificate representing five sovereigns; and no banker or private individual ought to be allowed to issue such tokens or certificates any more than they are permitted to issue the coins of the realm. The notes or certificates ought to be issued as the money, whether copper, silver, or gold, is coined, under strict provisions of law, and by an authority such as the mint, established by law, and subject to strict regulations laid down in that law." Upon this point, his Lordship adds "I beg to quote a passage from the celebrated sub-treasury speech of Mr. Daniel Webster, the American Senator, and an authority in the United States, the very highest that can be referred to upon questions of this nature. It is this:

"The circulation of paper tends to displace coin, it may banish it altogether. At this very moment it has banished it." "I would ask the Committee to mark well that fact. There is a distinct statement of the entire banishment of coin from the United States by paper money, payable to the bearer on demand, and issued in obedience to what were deemed to be the wants of the country." "If others may drive out the coin, and fill the country with paper which does not represent coin, of what use is that exclusive power over coins and coinage which is given to Congress by the Constitution? wherever paper is to circulate, as subsidiary to coin, or as performing in a greater or less degree the function of coin, its regulation naturally belongs to the hands which hold the power over the coinage. This is an admitted maxim by all writers; it has been admitted and acted upon on all necessary occasions by our own Government, throughout its whole history.

"Third—The coins are maintained at their proper amount and value by virtue of the intrinsic value of the metal of which they consist. The paper notes or certificate ought to be preserved at their proper value by making them, under all circumstances, conform in amount to the coins or metallic circulation which they represent."

"Fourth—The sole privilege of coining money, whether copper, silver, gold, or paper, ought to be vested in one institution, established for that exclusive purpose, and subject to strict regulations of law. No share of such privilege ought to be conceded to private individuals."

"Fifth—All profit arising from the issue of paper certificates, that is bank notes, in place of coin of intrinsic value, ought to be appropriated to the public exchequer, and ought not to be diverted to the benefit of banks or any other concerns."

"Sixth—Perfect freedom of competition should be established in the business of banking, correctly understood, and effectually distinguished from the function of coining or from that of issuing paper tokens or representatives of coins, that is bank notes, which in fact, is coining under a form peculiarly susceptible of abuse, because the undue issue of paper notes is not restricted by that intrinsic value which effectually regulates the issue of metallic money."

I shall now proceed to examine these assumptions; and in the first place am ready to admit that it is universally recognised as right and proper that the State should exercise an undivided control over the coinage, or metallic portion of the currency. With this, of course, banking has nothing to do, and here I may remark that the business of banking does not simply consist of borrowing and lending money; a banker is also a buyer and seller of currency.

There can be no doubt that Bank notes are the representatives of current coins, inasmuch as each note bears on its face a promise to pay a certain number of such coins on demand. But all paper which can be classed under the head of currency is equally the representative of metallic money. A cheque which is a bill of exchange, also payable to bearer on demand is a representative of coin. A promissory note payable two or three months after date, also represents coin, with this difference that the payment is deferred. But in principle all three are the same. All three are based on the credit of the issuers, and equally belong to the currency of the country. Lord Overstone says "a £5 note is, in fact, a token or certificate representing five sovereigns, and no banker or private individual ought to be allowed to issue such tokens or certificates any more

than they are permitted to issue the coins of the realm." In effect he denies to bankers and others the right of issuing any paper whatever, that his adoption of Mr. Daniel Webster's dogma that, "*Wherever paper is to circulate, as subsidiary to coin or as performing in a greater or less degree the function of coin, its regulation naturally belongs to the hands which hold the power over the coinage.*"

Now this principle when carried out to its legitimate consequences, must inevitably lead to the suppression of banking, since the figures in a Ledger which indicate the amount of the Bank's debt to a depositor, are neither more nor less than certificates or tokens representing sovereigns. They constitute, in fact, the Bank's promises to pay at the customer's order, to bearer on demand, a certain quantity of gold coin.

"In former times" according to Macleod "the banker gave his *promise to pay* in the form of notes, which practice continued to be used by London Bankers till about 1772, when they changed the form, and adopted the plan of giving their promises to pay in the form of figures placed to the credit of their customers' accounts, and gave them cheque books, and permitted them to draw bills on them, payable to bearer on demand. When bankers issued notes, they intended them to circulate as freely as money, and undertook to pay them to anybody that presented them. When they persuaded their customers to adopt the method of cheques as a substitute for notes, they must equally have undertaken to pay them to bearer on demand, to make them as like money as possible."

It is evident therefore that in principle there is no difference between cheques and bank notes. Let us suppose, by way of illustration, that a Bank in Sydney has discounted a bill for A; that is to say that it has bought for a certain sum a debt owing to A. We will assume that the proceeds af the sale amount to £100. If A has an account at the bank this sum will be passed to his credit, that is, an entry will be made in the Ledger, which shall constitute the Bank A's debtor for £100. Now let us suppose that another person named B has in a similar transaction received £100 in notes. Will not the position of the Bank in respect to B be precisely the same as that which it holds in regard to A?

B has only to present the notes and demand gold.

A also has only to present his cheque and demand gold also. The difference is that in the one case the Bank's promise to pay is engraved on pieces of paper, whilst in the other, it is written in figures in the Bank books. But will the Bank be less able to meet the one engagement rather than the other? It really seems perfectly absurd to insist that the note circulation of the Banks amounting to about £900,000 in this colony, is not on a sound footing, when the sum of four millions sterling in the shape of deposits, or promises to pay inscribed in the Bank Ledgers is considered to be quite secure.

In the case above mentioned it is very probable that instead of presenting his cheque immediately and claiming one hundred sovereigns, A would draw several cheques and give them to different persons in exchange for services or commodities. Would not such cheques be the representatives of current coins? Would they not be paper tokens or certificates circulating in lieu of metallic money? It follows then that Lord Overstone's principle applies with equal force to Bank notes and to cheques which are merely substitutes for bank notes. Moreover, if it be deemed dangerous to allow a Bank to issue its promissory notes payable on demand, it is doubly so to permit individuals to circulate their orders or cheques, for the latter are undoubtedly liable to abuse.

An individual can defraud the public, when on the strength of his credit he negotiates orders or cheques without having coin to meet them, seeing that a bank's acceptance of a cheque is only conditional on the drawer's having sufficient funds in their hands to liquidate it; whilst when a bank issues its notes, it must for its own safety retain sufficient coin to meet all probable demands. Cheques are not unfrequently dishonoured; orders often circulate in the country districts at a considerable discount, and are not unseldom unpaid on presentation; but when has discredit been cast upon the notes issued by the Banks? To deprive them of the power of issuing notes, yet still to permit the use of cheques and orders, would be to commit an act of the grossest inconsistency and folly. To quote Macleod—"A cheque *may* circulate as long as a bank-note, a bank-note *may* be paid into the bank as quickly as a cheque. The sole difference arises between the comparative number of the general public who may be willing to receive one form of payment by credit rather than the other."

But Lord Overstone's principle applies also to promissory notes payable at a future date; in fact to all bills of exchange, which are undoubtedly paper certificates or tokens representing certain quantities of current coins, the payment of which is only deferred for a specified period, in consequence of which their power of motion or circulation is much less than that of notes or cheques payable on demand. And with regard to the comparative safety of bills payable at the end of two or three months, I cannot do better than refer to the opinion of Mr. Wilson who says, "Notes payable on demand can never be kept out in excess, because the excess would always return to the bank for payment, while bills at two months may be issued in great excess, there being no means of checking the issue till they have arrived at maturity, when they may have been replaced by others. For people to admit the safety of the circulation of bills payable only on a distant day, and to object to the safety of a circulation of paper payable on demand, is to us, perfectly unaccountable."

Applying Lord Overstone's principle to ourselves, I am at a loss to comprehend how the State could deny to the Banks in Sydney the power of issuing promissory notes payable on demand, and consistently permit them to issue bills of exchange on London. For I would ask which afford the greater guarantee of safety to the public, the paper certificates which can be immediately exchanged for sovereigns, or the paper certificates or obligations to pay sovereigns in London 60 days after sight? The average note circulation of the Banks in the Colony amounts in round numbers to £900,000, but it is no exaggeration to state that the payments effected by bank bills of exchange, which are issued solely on the credit of the various institutions, amount annually to several millions sterling. Having I trust shown that Lord Overstone's principle is fallacious, since to carry it to its legitimate consequences involves the monoply of all paper whatsoever by the State, and would also lead to the suppression of banking, I shall now proceed to consider the questions of our issues and depreciation. The first implies that a bank can multiply its promises to pay in the form of notes at will, irrespective of the requirements of the community; the second, that bank notes payable in current coins to bearer on demand can become of less value than

the coins they represent. Respecting over issues Lord Overstone cites the example furnished by the banks in the United States of America; let us therefore see what actually occurred in that country.

In a pamphlet by Mr. Combe published in 1856, and written in support of that very Bank Act of 1844 which Lord Overstone greatly assisted in framing, we find the following account of the monetary crisis which took place in the United States, in the years 1837-38-39. "Some of the States passed Acts by which a public comptroller was authorized to take from any individuals or associations of persons wishing to issue bank notes, pledges of State Stocks, yielding dividends, and mortgages upon improved, productive, and unencumbered lands, and to give them in return notes certified by him as thus secured, to be used by them at their own discretion as currency."

"The articles pledged, although hypothecated to the comptroller remained the property of the currency vendors, who drew the profits and dividends of them for their own advantage, as long as no demand was made on the comptroller for liquidation of the notes. The annual returns of the things pledged may be stated at seven per cent., and the bank notes when lent out in discounting bills, or on mortgages, brought other seven per cent., this being the common rate of interest in the United States."

"Jonathan was not slow in discerning that this was a capital speculation. For 100,000 dollars of capital, he obtained the profits of 200,000 dollars, *minus* the expenses of the paper on which his notes were printed, and those of his establishment of cashiers, clerks, and porters, for carrying on the circulation."

"There was immediately a rush towards pledging *securities* and issuing bank notes, and money became exceedingly abundant; the price of every commodity rose with a rapidity corresponding to the issue of the notes; every man who bought and sold, believed himself enriched. In New York, the bottom of the sea next to the streets was actually mapped into lots, and became a subject of extensive dealing."

Now the bulk of these notes were *nominally* convertible into coin *on demand*, as stated by Lord Overstone, but *practically* they were not convertible, because they were issued againt "securities" of an inconvertible nature. When the reaction set in and the banks were besieged by persons demanding payment in specie for the paper they presented; the issuers coolly informed the public that as the comptroller held securities, the notes were perfectly safe and equal in value to hard cash. Admitting therefore that an over issue of paper did take place in the United States, and that the precious metals in consequence of that over-issue were banished from the country. I am still prepared to maintain that under a proper system of banking, such an over-issue would not have occurred. And first I would beg of you to bear in mind that the notes though nominally payable in specie, were issue against "securities" not against coin. The issuers having pledged a certain amount of "securities" to the public officers appointed for the purpose of controlling the currency, conceived themselves released from all responsibility, and neglected to provide coin, as stated by Combe, it was too good an opportunity to be lost, and all who possessed "securities" rushed immediately to pledge them, since by so doing they at once doubled their capital. Evidently the amount of paper thrown into circulation was in no way based on the wants of the country. To infer that it was is palpably incorrect. Suppose a similar opportunity had been furnished to the holders of Stock in Great Britain, why, as Macleod justly observes, the whole of the National debt amounting to about £800,000,000 might have been represented by bank notes. But would it be right to infer that this amount of paper was in accordance with the requirements of the nation?

I resume, the great augmentation in price of all commodities resulting from the inordinate increase of paper money, checked exportation and the United States became rapidly indebted to other countries, while as this debt could not be discharged by means of notes, it naturally caused a drain of the precious metals; consequently when the crash came, the issurers of notes had only their "securities" to fall back upon.

Moreover, the notes of which I speak, besides being issued against securities instead of coin, were, by an understanding between the banks themselves, and between them and the public really not convertible. Mr. Wilson, who is my authority, says, "by an agreement between the different banks, they never called upon each other to pay the notes in specie; and thus each bank always held large quantities of the notes of other banks, for which they did not demand payment; and such was the political prejudice against the payment of specie that any private individual who demanded the payment of coin to any large amount, was marked as a common victim by the banks. The latter practice, however, would have been altogether unavailing, had the banks themselves exchanged regularly with each other, as the Scotch Banks do, twice in each week, the balance being paid in cash. No over issue could have taken place."

The fundamental error of the American system was the permission to issue notes against "securities" instead of coin, and this mistake which might in some measure have been palliated by a sound system of banking, was aggravated by a vicious one. In Scotland, under a system of free competition, untramelled by legislative interference the convertibility of the bank note was never questioned.

In these Colonies it is utterly impossible for the Banks to increase their issues at will, or to circulate more paper than the community requires. The notes are issued against coin, and the Banks exchanged regularly each week between themselves, the balances being paid in gold in Sydney, and by drafts on the Sydney offices of the respective establishments, at the country branches. Each quarter sworn returns of the average assets and liabilities of the Banks in the Colony are published in the *Government Gazette* and through the medium of the press are made generally known to the public.

It is evident therefore that no parallel can be drawn between the American system which I have described, and that which prevails in Australia, which resembles in many points the Scotch system, although there are features in the latter which do not appear suitable to our circumstances.

I allude to the practice of allowing interest on sums lodged which may be withdrawn without notice or as it is commonly termed "money at call."

But the system of competing issues which has always answered so admirably in Scotland and which, by increasing the power of the banks to promote and facilitate commercial operations, has so largely contributed to advance the industrial developement of that country, has been, and will always be found, equally advantageous to New South Wales.

This Colony indeed affords a complete refutation of the doctrine that compelling banks when unrestricted by law, can expand their note circulation at will, irrespective of the requirements of the community, for if issuing paper promises to pay, be so feasible and so profitable operation, how does it happen that the note circulation which by the returns of 30th June, 1857, amounted to £946,008, had fallen by the 30th June, 1858, to £897,056? During this interval some of the Banks had opened new branches in the interior, and the produce of the gold fields had increased, yet, in the face of these facts, the note circulation shows a decrease of about £50,000. But on referring to the returns to Government, we find that the note circulation amounted on 30th June, 1854, to £1,019,499, that is to say that it exceeded the present issues by upwards of £120,000!

According to the Select Committee's Report in 1852, the Bank of New South Wales and Commercial Bank are restricted in their issues to the amount of their paid-up capital. The Bank of Australasia, incorporated by Royal Charter, has a paid-up capital of £900,000, and has the privilege of extending its issues to the amount of its deposits, and three times that of its paid-up capital, and the Union Bank is wholly unrestricted.

Why, I would ask, do not these institutions avail themselves of their right of issue to the fullest extent? The question is simply solved. The Banks can only issue as much paper as the country requires, because under a system of free competition and competing issues, with the admirable method of exchanging between themselves, all notes issued in excess, being paid into other Banks, are at once returned to the issuers who must redeem them with gold.

You will please to observe that this is no matter of assumption or opinion, but an undeniable fact, and it therefore follows as a natural consequence that, as there can be no over issue, so there can be no depreciation of the notes, inasmuch as depreciation is the result of over issue. The truth is, that Bank notes convertible into gold on demand can never be of less value than the coins they represent. Sir Robert Peel, himself admitted this when he said, "suppose you have depreciated your paper, and your paper still remains convertible into gold, do you think that every man who had a right to insist upon receiving five sovereigns for his £5 note, would not immediately insist upon that right the moment be found that gold was more valuable than paper?" With the utmost respect for the late Sir Robert Peel, I am utterly unable to comprehend how paper actually convertible at par could possibly be designated as depreciated.

I need now only briefly review Lord Overstone's fifth assumption, namely, "that all profits arising from the issue of paper certificates, that is bank notes, in place of coin of intrinsic value ought to be appropriated to the public exchequer, and ought not to be diverted to the benefit of banks or any other concerns."

It must, I think, be admitted, if the views I have taken be correct, that the State has no more right to the profits arising from the issue of bank notes, than to those derived from the use of cheques, which means the profit resulting from the use of sums deposited in the Banks, the *promises to pay* which are inscribed in the Bank Books. Or that the State has just as much right to the profit on all promissory notes payable at future dates, and bills of exchange; for the principle which asserts the State's right to monopolize the issue of all paper which is the representative of coin or subsidiary to coin, includes of necessity cheques, orders, promissory notes of all descriptions, and bills of exchange. But there is another view which may be taken of the subject would the public derive any advantage from the change? The difference between the amount of notes in circulation and the stock of coin held to meet all probable demands, is equivalent to so much additional capital to the Banks, and by augmenting their resources, enable them to afford greater facilities to their customers on lower terms than would be granted were they deprived of the power of issue. Gilbert states that in Scotland one result of Legislative interference has been an increased scale of charges to the public, for the Banks there being compelled to hold a larger amount of unproductive coin, indemnified themselves at the expense of their customers, thus showing that *restrictions on Banks are in reality taxes on the public.* It is easy to foretell that if the money power of the Banks in this Colony were diminished by upwards of half a million sterling as would be the case were a sole Bank of Issue established, the increased charges to the community which would necessarily follow, must greatly exceed the profits on Government Notes, profits which would be paid into the public exchequer, and absorbed into the vortex of public expenditure.

I trust I have shown sufficient cause for differing from so eminent an authority as Lord Overstone, and that I shall not be accused of presumption for having ventured to oppose his opinions. The following conclusions are based on the facts and arguments advanced in this paper.

First—That the State has no inherent or natural right to be the sole issue of the paper currency; and consequently it has no right to the profits derived from the issue of paper.

Second—That under the system of free competition in Banking, and of free competing issues which now exists in these colonies, unfettered by Legislature interference, no over issue, and consequently no depreciation of bank notes can take place.

There is an argument in favour of a Sole Bank of Issue which at first sight appears plausable,—namely, that where there is only one issue of notes in circulation the eye becomes accustomed to it and the risk of forgery is lessoned; but I think on examination that the danger of forged notes obtaining currency will be found augmented, because where there is only one issue, people would less carefully examine the notes they received. They would probably content themselves with a glance at the amount, whereas now most persons look to ascertain *which* Bank's notes they receive, which requires a closer inspection of the paper, again, the chief danger in the present day appears to result from the astonishing progress of the art of Photography, and it is evident that with a Sole Bank of Issue, if its paper could be counterfeited to any considerable extent, the only way to allay the alarm of the public would be to call in the whole note circulation and to alter the plate or colour of the paper. From such a step not only heavy loss to the State, but a total derangement of the currency would ensue, and indeed unless the State Bank held a very large amount of coin, it might find it difficult to meet the sudden and extraordinary demand for gold which would arise.

Now, on the same hypothesis, with eight or more Banks of Issue, it is not probable that forged notes of every institution could be circulated at one time, and the issues which were not suspected or discredited would expand gradually as the limited issues were called in, till the void in the currency was filled.

As a case in point I may cite that of the Union

Bank in Victoria several years ago. A box of note forms of this Bank was stolen from a ship in Hobson's Bay and this becoming known, the Union Bank was compelled to call in its issues and to alter the plate. By an arrangement with the Bank of Australasia the notes of that establishment were substituted for those of the Union Bank, the Australasia's issues afterwards returning to their former level as the Union's new notes came into circulation. It is clear that had the Union been the sole issuing bank, immense confusion would have taken place, as there could have been no substitute for its issues.

I may here observe, however, that in Scotland with competing issues, forgery of bank notes has been almost unknown. On the land the losses of this nature sustained by the Bank of England have been enormous.

A most powerful argument against a Sole State Bank of Issue is the danger of its being tampered with by a needy Government, prevailing on the Legislature to sanction a violation of the law. European history teems with examples of such practices. No act of Parliament can guard against such an eventuality, for they who make the laws can also unmake them, and when we see the law of England suspended whenever a commercial crisis overtakes the nation, can we rationally believe that the constitution of a state Bank of Issue in this country, would be respected in the pressing hour of need.

No. Far better will it be found to place all temptation beyond the reach of future Governments by preserving inviolate a system which has passed through the ordeal of time and experience, which has stood that severest of tests—sudden prosperity, and the fluctuations attendant on a change in the circumstances and condition of a country scarcely paralleled in the history of the world.

In conclusion I will simply remark that the occasions on which the action of the Legislature in respect to Banks can be deemed necessary and salutary, arise when the sanction of Parliament is sought for the creation of new institutions. I think there should be no limitation to the number of partners, and these should be bound jointly and severally, so that each partner should be liable to the full extent of his fortune for the whole debts of the company. Such a regulation ensures a strict supervision of the affairs of an association by its own members. The liability should not cease on the withdrawal of a shareholder by sale or transfer of his share, until one year at least had elapsed form the date of such retirement.

I think too, that as the means of internal communication are perfected, it may become advisable that the returns of the average assets and liabilities of the Banks in the Colony should be published monthly instead of quarterly, in the *Government Gazette*. Such publicity acts as a wholesome check on the various establishments, and also furnishes valuable information respecting the movements of Capital and Currency in the country.

All other Legislative action is both unnecessary and uncalled for. Indeed were a minister of the Crown, like the Statesman of old, to come to the Banks to-morrow and say, "what can I do to advance your interests"? Our reply like that of the French merchants on the occasion I allude to, would be, "The greatest service you can render us is to leave us alone."

EDWARD R. DRURY.

TABLE showing the average *Note Circulation* and *Deposits* of, and *Coin and Bullion* held by the Banks in New South Wales, during the Quarter's ending on 30th June, from 1848 to 1858, inclusive.

Quarter ending 30th June.	Circulation.	Deposits.	Coin and Bullion.
1848	£240,268	£1,227 684	£587,239
1849	243,059	1,181,363	637,255
1850 Sept.	258,819	1,421,457	584,753
1851	317,360	1,743,331	741,772
1852	494,450	1,377,666	686,510
1853	801,943	3,321,885	2,303,862
1854	1,019,499	4,455,104	2,441,847
1855	950,686	4,121,729	1,626,779
1856	814,284	3,841,174	1,915,173
1857	946,008	4,425,148	1,746,016
1858	897,056	4,032,495	1,604,103

NOTE.—During several years the Bank of New South Wales included its Victorian branches in the Returns to Government, and I have consequently been compelled to make allowance for them.

In the foregoing imperfect statement, the two first columns are however, I believe, quite correct; in the third column which shows the Coin and Bullion held by the Banks, there may perhaps be discrepancies in several amounts.

Note on the allowance of Interest on Deposits.

In the preceding paper I have alluded to a feature in the Scotch system of Banking, which though now prevalent in England also, appears to me objectionable and unsuited to these Colonies. I mean the practice of allowing interest on sums lodged in the Banks, which, may at any moment be withdrawn. The objection is that the Banks instead of maintaining large reserves of unproductive coin, as at present, would so find themselves unable to do so, since having to pay large sums of interest on the money deposited with them they would not be able to afford to keep sovereigns lying idle in their treasuries, but would be tempted either to extend their operations thus promoting speculation and giving an unhealthy activity to trade, or else to invest a large proportion of their coin in interest-bearing securities.

Now in England and Scotland, where the Banks are all in close proximity to the greatest market in the world, they can safely hold a large amount of Government Securities, seeing that in the worst panics, these are usually convertible, though it may be at a loss; but when a pressure commences, the Banks who hold state securities can prepare for the approaching storm, by disposing of their stock, and augmenting their reserves of coin. In these Colonies, however, there is no market for Government Securities, and practically they are quite inconvertible. The Banks therefore which had invested largely in such securities might find themselves very unpleasantly situated in a time of pressure, for though perfectly solvent, they would perhaps be unable to procure a sufficient amount of specie to satisfy the requirements of the public. In fact the coin would no longer be in the country. Being exchanged for Government securities, it would speedily be absorbed by unreproductive public works and although whilst commerce continued to flourish (and it would be arificially stimulated for a brief period)—the absence of coin might not be felt, yet when the inevitable reaction set in, in would no longer be forthcoming, and great inconvenience as well as loss would ensue.

The objection I have sketched applies chiefly to the allowance of interest on money left at call,

a practice which I am happy to say has been discontinued in New South Wales, though still prevalent in Victoria. The Banks in these two Colonies were compelled in self-defence to allow interest on sums lodged for fixed periods, when the Governments came into competition with them, offering 5 and 6 per cent interest on their debentures. Had the Banks not allowed interest, it is evident that a large portion of their deposits would have been withdrawn, and invested in Government Debentures. So long as the Colonial Governments seek to raise money on the spot, and thus compete with the Banks, the latter will be compelled to allow interest on sums lodged for fixed periods. Perhaps when it is considered that the money obtained by Government is *floating* capital, which, would otherwise be employed by the Banks in promoting trade operations, and developing the industrial resources of the Colonies, the policy of converting it into *fixed* capital in the shape of public works, most probably of an unreproductive nature may I think be fairly questioned.

E. R. D.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

TWENTY-FIRST MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange.

Tuesday, October 5th, 1858.

Members of Council present;—Messrs. T. W. Shepherd, J. Graham, and W. Deane, Honorary Secretary.

MINUTES.

Minutes of the last meeting read and confirmed.

READING OF PAPERS POSTPONED.

It was resolved that on account of the thinness of the meeting caused by the severe inclemency of the weather, the reading of the papers be postponed until next month.

NOTICE OF PAPERS FOR NEXT MONTH.

His Excellency the Governor-General Notes on the supply of Animal Food to the Inhabitants of New South Wales.

Mr. W. Redman on the necessity of Roads to keep pace with the necessities of Agriculture wherever public lands are disposed of.

The next monthly meeting will be held on Tuesday, 2nd November.

ON THE AGRICULTURAL STATISTICS OF NEW SOUTH WALES, READ FEBRUARY 4TH, 1857.

By Sir William Denison, K.C.B., *President*.

"I lay before the Australian Horticultural and Agricultural Society, a volume containing the statistics of New South Wales for the last ten years. And I wish more especially to call the attention of members to the agricultural returns. There is much in the numerical information thus brought under the notice of the society which ought to attract attention; and though I cannot pledge myself to the perfect accuracy of all these returns, yet I have every reason to believe that, as they have been prepared from year to year upon the same system, dependance may be placed on their relative accuracy at all events.

"These returns commence with the year 1846 and terminate with 1855—the last for which the number could be correctly ascertained—and it would seem that in the former year the total number of acres under cultivation, including 32,674 producing hay, was 151,034; while in 1855, including 32,666 acres sown for hay (being within a very small fraction the same amount applied to the same purpose ten years ago,) the land under cultivation amounted to 170,070, an increase of 12½ per cent. in ten years. On reference to the returns showing the number of the population at these two periods, I find that in 1846 the total number of the inhabitants was 189,609, including the population of Port Phillip; while in 1856, according to the late census, the numbers amounted to 266,189, showing an increase, within the present limits of the colony, of upwards of 40 per cent. If, then, the land under cultivation in 1846 was but sufficient for the supply of the then population, it follows, of course, that it must be altogether inadequate to maintain the present increased numbers. On reference, however, to the returns of grain, flour, &c., imported in 1846, we shall find that the total value at the then low prices amounted to £53,780; while that of the exports did not exceed £10,592, so that even in 1846 the colony had to pay £43,188, for food, which it might have produced for itself. If we look more closely into the actual returns for 1846, we shall find that 233,552 bushels of wheat were imported, while only 20 were exported; that the exports of maize exceeded the imports by 1331 bushels; that 35,261 bushels of barley and peas were imported, while but 545 were exported; that the import of flour and bread amounted to 3,239,936 lbs., and the exports to 3,433,504 lbs., the difference, 193,568 lbs., being equivalent to about 4032 bushels of wheat; that of rice 1,225,728 lbs., were imported; and of potatoes 2166 tons, 3 tons of the latter being exported.

"It would seem, then, that in 1846 the supply of grain for human food fell short to the extent of 229,500 bushels; and as in reference to the agricultural returns we find that the average yield of wheat was 14·7 bushels per acre, it is evident that in order to feed the population even then, 15,626 additional acres should have been sown with wheat, —or that instead of 73,108 acres the amount should have been 88,734 acres. If we refer to the returns for the last year we shall find that the inferences drawn from the statistics of 1846 have been fully verified.

"The land under wheat had increased since 1846 from 73,108 to 86,369 acres, and the yield was at the rate of 15·44 bushels to the acre; but the returns of imports and exports show that 836,363 bushels of wheat were imported, and only 15,310 exported; that the exports of maize exceeded the imports by 31,532 bushels; that barley, oats, and peas were imported to the extent of 183,985 bushels, of which 34,852 bushels were re-exported; that 17,976,000 lbs. of flour and bread were imported against 2,171,008 exported: that 5,612 tons of potatoes were imported, and 869 only exported.

"The balance between the imports and exports of flour, namely, 15,804,992 lbs., is equivalent to

about 329,270 bushels of wheat, so that the total imports of wheat may be put at 1,150,323 bushels, and at the average of last year, 15·4 bushels to the acre, this would be equal to the produce of 73,270 acres. If we go into an analysis of the other heads under which our agricultural statistics are exhibited, and compare the actual produce of the land with the amount of the consumption of the population, we shall arrive at the following results, which I have exhibited in a tabular form as admitting of easy reference:—

Articles.	Amount consumed in colony.	Produce per acre.	No. of acres to produce the whole amount required.	No. of acres under cultivation.	Difference.
	Bushels.	—	Acres.	Acres.	Acres.
Wheat .	2,485,769	15 .7	158,329	86,369	71,960
Maize .	984,962	29 .5	33,388	34,407	1,019*
Barley, oats, & peas .	263,885 Tons.	16 .1	16,330	7,090	9,300
Potatoes	43,039	4.18	39,430	38,296	1,134
			247,537	166,162	
			166,162		
Deficiency			81,375		
			*Excess		

From this it is evident that the land under cultivation is not in any way adequate to provide for the maintenance of the inhabitants of this colony, that, with the single exception of maize, the amount produced falls far below the quantity consumed, and with reference to the main article of food—namely, bread—upwards of 70,000 acres in addition to the 86,000 already under cultivation, would be required to supply the wants of the present population, to say nothing of increase which is annually made to it by births and immigration. When I say that this addition should be made to the land under cultivation for wheat, I assume that the produce per acre is to remain at its present low rate of 15½ bushels to the acre. Should, however, a better system of cultivation prevail, and the acreable yield be increased to what it ought to be, namely, to 25 or 30 bushels per acre, it is evident that the land already under cultivation would be quite adequate to feed the whole population, in which case the amount which has been expended in the past year in importing food would have passed into the pocket of the agriculturist of the colony. Let us see what this amount would have been. The value of grain, &c., imported is put at £717,779, and the exports at £91,644, the difference, £626,135, is the amount which the farmer whould have secured by a more careful system of cultivation. If this amount be divided by the number of acres it would give as near as possible £4 to the acre a sum more than sufficient to cover any additional cost which the preparation of the land or the collection of the crops might entail upon the farmer.

"Some persons when they see so large a sum withdrawn from the colony for the purchase of food might be inclined to fancy that the agricultural portion of the community require protection—that is, they would advocate the imposition of an import duty upon grian and flour, by which the price of these articles would be raised to the community at large, in order to induce the farmer to bring more land under cultivation, or to carry out an improved system of husbandry by the prospect of enhanced profits. I do not intend to go into the question of free trade as opposed to protection, but I would observe, that before any class of the community can claim to be protected, it should be prepared to show that it has exerted its utmost energies in its own behalf; that, as regards the farmers, they have done their best to encourage labour by the application of machinery, to develope the dormant energies of their soil by the application of manure; that they have, in short, made their land produce the maximum amount which it is capable of doing. That this is not the case it is unnecessary for me to say. I trust however, that the prospect of obtaining a share of the large amount of money which is now expended in importing wheat and flour may stimulate our agriculturalists to devote more attention to the cultivation of their land, I mean of the land which is already under cultivation; for it would be far more profitable to them to add 50 per cent., by a small outlay, to the yield of their present farms than to expend labour and capital in bringing more land into cultivation in order to subject it to the same ruinous course of exhaustion which has reduced the wheat land of this colony to a condition analogous to that of the American States on the seacoast.

"The tables which I have laid before the society will well repay the labour of analysing. I have limited my commments to those portions which allude more specifically to the growth of cereal produce.

"The returns of cattle and sheep, of vineyards and wine, afford interesting results, and it would be well worthy of the society to press upon the government the propriety of attempting to secure a set of agricultural returns of a more reliable character than these which I have laid before it."

ON THE MEANS BEST ADAPTED IN THE PRESENT CIRCUMSTANCES OF THE COLONY FOR IMPARTING AGRICULTURAL INFORMATION.

Read, July 3rd, 1857.

By James W. Waugh.

It is some months since I announced my intention of reading a paper before the Horticultural Improvement Society, on the means best adapted in the present circumstances of the colony for advancing Agricultural Education. At that time though the promotion of Agricultural Science was no doubt one of the characteristic features of the Society, it had hitherto received less attention from its members than many other matters, however, important they have been, and if it was with some diffidence I ventured to announce my intention of entering upon the question then, it would be with much greater reason now, were it not that the way has been in a great measure paved for me, from the remarks on the same subject in the admirable address of your president, at the opening of this Society. All of you who were then present and marked the interest it excited, could not fail to be struck with the idea, that a new era was drawing upon us, that augured well for the country generally. It might seem superfluous therefore, to go over the same ground, but I cannot for one think so, and if I may be pardoned for the assertion, it is seldom that important truths carry conviction to the mind at their first announcement, but it is the repitition of the same thing, varied perhaps in expression, that by dint of being frequently repeated, makes itself heard by its continuous knocking till the understanding can be brought to open to its entrance. I am conscious, however, that while there are many now hearing me who are more interested in what relates to the garden than the field, and who may on that account feel less inclined to give the subject that consideration which it so essentially demands, I trust it may

receive their attention, and I would only say to such that while I fully participate in the feeling, that

> Tis lovely to see the bright blush of the flower,
> As she opens her buds in the fair woodbine bower.

Yet it is agriculture that has to do with the continually returning wants of man; and the price of bread, and the supply of it which must of necessity regulate the every day transactions of life call upon us to do every thing in our power to advance that science, so that all may have bread enough and to spare, without depending upon foreign aid for our supply. There is no art so universal and so necessary to the wants of man as the cultivation of the soil. We produce by it those vegetables without which it would almost seem impossible for man to live, and the greater attainments in which go far to prove his advancement in the scale of civilization. The state of the agriculture of a country has therefore engrossed the attention of its legislators and statesmen in all ages, and whatever opinion may exist as to the wisdom of legislative enactments on such a subject, the fact of such being the case proves its very importance. A nation to be prosperous must be self supporting, and though it undoubtedly may be so by exchanging its manufactures and staple commodities for the necessaries of life from other countries, yet in so far as it is able to produce these within itself, to that extent will it be independent of the fluctuations of foreign markets, and thus able to devote more attention to its manufactures and other branches of social industry. The food we eat, and its sufficiency must ever have the greatest claim upon our attention. Admitting this principle then, it becomes the more important on all who desire the prosperity of a young colony such as this, to promote the cultivation of the soil as far as possible; and though much outcry has been made about the difficulty of procuring land for agricultural purposes, without stopping to enquire, however, well or ill-founded this may be. I think it cannot be for a moment doubted that there is abundance of such land in the hands of the agriculturists of the colony at the present time, to provide for the wants of a population ten times greater than it now is, were due pains only taken to make it more productive. The annual importations of wheat and flour are a disgrace to us. In 1855, it amounted to upwards of £700,000, and may just be looked upon as so much money thrown away. Is the soil of Australia less capable of producing grain than the soil of other countries? If not—what then is the cause, and the answer may readily be given, it is the culture not the soil we are to blame, and before it can be otherwise—indifference, sloth, and negligence must give to carefulness, and ignorance to knowledge combined with energy and activity.

There are various ways of accounting for the indifference with which the noble science of agriculture has been treated hitherto, and the most apparent one is, that few have followed it as their trade or occupation. It has been left very much to chance as it were—if a crop grew good and well, but if not, attention was forthwith directed to something else. In ninety-nine cases out of a hundred, it may safely be pronounced that those who have to do with it have never been brought up to it. For every other trade a long apprenticeship has to be served, ere a sufficient knowledge of it can be attained, but in this most necessary one, it would seem as if none were considered necessary. The virgin soil which at first yields its fruits so bountifully without much skill or labour being required in their production leads to the belief that farming is an easy matter, and any man, no matter what his previous training may have been, who can procure a piece of land, settles down on it in the belief that it will always be so, but no sooner does it begin to refuse the continued drafts upon its capabilities, then he is discouraged and discontented, becomes careless and indifferent—suffers that to be neglected which he ought to have performed, and allows much to go to waste which a little skill and well directed labour might easily have saved. It is hard to convince a man of his errors, and the spirit of vain boasting and self conceit which is alas too much becoming the characteristic of the colonists generally, shuts up the avenues by which experience and knowledge may enter.

It will ever be the case in a young colony, that amongst the cultivation of the soil there will for some time be found a great preponderance of those who know little and have never been brought up to know anything of the art of farming. Such being the nature of things, time alone will cure it—but it is at that point when sufficient time has elapsed to allow things to be settled down in a more regular and systematic manner that the mind awakens to the discovery, that there is really more science required than was at first thought necessary, that farming after all requires some study, that knowledge is in reality power; for that best of all teachers *Experience* shows that good farming produces good crops, and good crops produce full pockets.

It is then that awaking to the discovery of its own ignorance, the mind is most susceptible of drinking in that knowledge it feels the want of, and impressions made at such a time have a more lasting effect than those of a later period. I trust that we have as a colony, now arrived at that stage of our existence, when the trial and fretfulness of our infantile years being over, we feel ourselves entering upon the full pledged condition of manhood. When the cares of life begin to develope themselves and make one feel that he owes a duty to himself as well as to others. If not at this stage yet, I think all will agree in saying that there is at least a growing interest manifested amongst our rural population in the acquisition of all knowledge bearing upon rural affairs, and which it is the duty of every one to encourage in the right direction, for all may lend their aid, and even as iron sharpeneth iron, so a man sharpeneth the countenance of his friend. How then to take advantage of this state of feeling? How we may best promote the interests of the agricultural class, or in the easiest, most correct, and most expeditious method impart an agricultural education is the object I have in view in bringing this subject before you to-night. Without going further I may briefly state that the means most commonly employed for this purpose are District Societies, Lectures, Periodicals, Museums, and Model Farms, and if we cannot at once adopt all of these means, it is a matter of inquiry which of them is the best adapted for the present circumstances of the colony. As to societies they may be regarded as the first step in agricultural progress—originating in the desire for competition, they awaken such a spirit of enquiry for further improvement, that they may be looked upon as the pioneers of this species of education, and it is pleasing to observe how much good those which have already started into existence in the colony have effected for the prosecution of this object. Those, however, are still far from doing all the good they might do, and that principally on account of the local character with which they are invested. Hence when produce is sent up to the Sydney market

which attained the first prize in the district to which it belonged, it may nevertheless be very inferior to that grown in other parts, not only in the plumpness of the grain, but the manner in which it has been got up, and the grower feeling dissatisfied if it does not obtain what he has been led to expect from its local celebrity it would, the highest price, is apt to lay the whole blame on the agent employed to effect the sale. To obviate this, it is a matter of consideration for this Society, whether an annual or biennial competion in Sydney of produce from all parts of the country could be efficiently carried out. It would no doubt be productive of much good by bringing many together who are interested in the prosecution of these labours, and by an exchange of each others experience enlarge their own. In fact the advantages cannot be overstated. Sir John Sinclair remarks on such a subject—"It made farmers residing in different parts of the kingdom acquainted with one another, and caused a rapid dissemination of knowledge amongst the whole profession. The art of agriculture was brought into fashion, old practices were amended and new ones introduced, and a degree of exertion called forth, heretofore unexampled among the agriculturists of this island." That there are difficulties in the way of getting up a general competition of agricultural produce, I admit, but they are not such as are insurmountable, and surely from our recollection of what was got together in so short a time for the Paris Exhibition, we may reasonably infer, from the numerous class who are interested in the produce of the soil, an exhibition might be got up creditable to the Colony and useful to the public at large.

Lectures and Periodical publications bearing on the subject are other important means for furthering Agricultural knowledge. The former of these may at the present time be impracticable, but the latter it is hoped will soon be supplied to a considerable extent by the publication in a connected form of the papers read before this Society, and which it is hoped all will feel themselves called upon to circulate as extensively as possible.

NOTE.—*We are compelled from want of space to postpone two or three letters of correspondents.*

METEOROLOGICAL TABLE.

SEPTEMBER, 1858.

OBSERVATORY, SYDNEY, LATITUDE 33·51 SOUTH; LONGITUDE, 151·14 EAST.
HEIGHT ABOVE THE SEA, 145 FEET.

Day.	Barometer corrected to 32 deg. Frnht.		Wind. Direction.		Force.		Temperature Max.	Min.	Cloud Extent.		Inches. in Rain	Remarks.
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M.	9	9		
1	29·959	29·909	W.N.W.	0	2	0	66·1	41·9	5	0		Thick haze at sunset; heavy dew
2	·919	·781	W.	N.W.	1	1	68·0	41·5	0	0		Very fine and warm throughout
3	·898	·820	S.S.W.	S.	3	2	59·0	46·0	10	10		Much rain afternoon & evening
4	·642	·534	W.	W.S.W.	2	3	65·0	49·5	9	9	·968	Light showers occasionally lightning to E.
5	·504	·472	W.	W.	3	2	66·0	41·0	10	1		Heavy shower in the evening lightning S.
6	·434	·452	N.W.	W.N.W.	3	4	60·9	50·3	10	5	·264	Light showers at intervals
7	·497	·575	W.	W.	3	3	61·6	44·5	0	10	·082	Fine forenoon; cloudy night
8	·662	·770	W.	W.	4	2	62·8	47·5	0	4		Fine; wind N.E. at 4 p.m.
9	·829	·862	W.N.W.	W.	1	2	59·9	41·4	0	0		Fine; cloudy at sunset; cleared at 8 p.m.
10	30·010	·987	W.	W.N.W.	2	1	61·2	42·6	0	0		Very fine; heavy dew at night.
11	29·882	·560	W.	N.N.E.	1	2	69·6	42·2	0	0	·003	Thick fog; 4-30 p.m. light shower; gale at night
12	·762	·784	W.S.W.	W.	4	4	59·5	44·6	0	0		Cold windy day
13	·771	·683	W.	0	3	0	60·5	43·0	0	0		Fine
14	·565	·515	N.N.W.	N.	2	1	70·9	41·9	0	0		Very fine all day.
15	·554	·705	W.N.W.	W.N.W.	3	4	66·0	56·7	10	8		Strong wind all day; warm and
16	·860	30·014	W.S.W.	W.	5	3	64·3	52·7	0	0		Fine [cloudy
17	30·147	·170	W.N.W.	N.W.	1	1	61·8	50·0	0	0		Very fine throughout [night
18	·211	·079	W.	N.W.	1	1	62·5	47·8	0	0		Fine throughout; heavy dew at
19	29·991	29·813	W.N.W.	N.W.	3	3	69·5	44·9	9	10		Cloudy; a few drops of rain at noon [p.m.
20	·683	·555	N.W.	W.N.W.	3	2	76·8	58·9	8	0		Hot wind all day; cloudy to 8
21	·763	·737	W.S.W.	S.	1	5	72·9	56·5	0	10		Wind to S. 8 p.m.; halo round moon
22	·548	·538	N.	N.E.	3	2	71·9	53·0	10	9		Cloudy; light shower at 3.30 p.m.
23	·514	·443	W.	E.S.E.	5	1	70·9	56·0	10	10		Showery; lightning at night
24	·385	·596	N.W.	N.W.	5	5	70·5	57·7	2	0	·103	Blowing hard all day
25	·809	·910	W.	N.W.	4	1	65·7	49·8	0	0		Fine throughout
26	·905	·796	W.	0	4	0	62·7	46·3	0	0		Clear and cold
27	·891	·900	W.N.W.	W.	3	2	68·6	48·3	0	0		Fine throughout
28	·937	·760	N.N.W.	N.	2	1	67·1	50·1	0	9		Strong sea breeze all the afternoon.
29	·513	·800	W.N.W.	S.	3	5	73·4	54·2	1	10		2·30 p.m. wind to S.; 3·30 N.E.; 7. S.; 11 rain.
30	30·026	30·066	S.W.	W.	3	1	59·3	45·5	9	0	·003	Cold and cloudy.
Mean.	29·769	29·752			2·7	2·1	65·8	48·2	·34	·35	1·423	Days Rain—9.

The thermometers and rain guage are on the Time Ball Tower, about sixty feet from the ground.
The extent of clouds is represented by the number of tenths of the whole sky, observed at the time of observation.
The force of the wind is represented according to the Observer's judgment, by numbers from 0 to 6, 0 representing a calm, and 6 a violent storm.

Registrar General's Office,
Sydney, 13th October, 1858.

HEALTH OF SYDNEY.

The number of Deaths registered at the Central Office during the month of September was 93, viz.:—60 males and 33 females. 13 deaths occurred from Scarlatina.

The number of Deaths registered during the corresponding month of last year and in 1856, are given in the Table below.

The number of Births registered during September was 176, viz.:—91 males and 85 females, being 83 in excess of the Deaths.

Births Registered during Quarter ended 30th September—	1856.	1857.	1858.
July	178	169	221
August	185	187	207
September	189	197	176
Total	552	553	604

Deaths Registered during Quarter ended 30th September—	1856.	1857.	1858.
July	100	106	112
August	96	97	94
September	97	88	93
Total	293	291	299

TABLE SHEWING THE DEATHS OF MALES AND FEMALES REGISTERED IN EACH WARD, FROM 1ST TO 30TH SEPTEMBER, 1858, DISTINGUISHING THOSE UNDER 5 YEARS.

WARD.	UNDER 5 YEARS.			ABOVE 5 YEARS.			GRAND TOTAL.
	Males.	Females.	TOTAL.	MALES.	Females.	Total.	
1.—Gipps	8	4	12	3	2	5	17
2.—Bourke*	4	1	5	10	3	13	18
3.—Brisbane	1	1	2	4	3	7	9
4.—Macquarie	1	...	1	2	...	2	3
5.—Cook	2	2	4	4	...	4	8
6.—Fitz Roy	5	3	8	2	2	4	12
7.—Phillip†	...	2	2	9	5	14	16
8.—Denison	2	2	4	3	3	6	10
TOTAL	23	15	38	37	18	55	93

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1ST TO 30TH SEP., 1858.

CAUSES OF DEATH.	Under 1 year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages.
ZYMOTIC DISEASES.																											
Endemic, Epidemic, and Contagious	4	4	6	2	2	18	2	1	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	23
SPORADIC DISEASES.																											
Of Uncertain Seat.—Dropsy and other Diseases of variable Seat.	6	1	...	...	...	7	1	1	...	...	2	...	1	...	...	...	1	2	...	...	1	...	...	...	..	...	16
Of Nervous System.—Diseases of the Brain, &c.	4	3	...	...	...	7	...	1	...	...	...	3	...	1	1	...	2	...	...	...	...	...	...	...	...	...	15
Of Respiratory System.—Diseases of the Lungs, &c.	1	1	...	...	1	3	...	...	...	2	4	1	4	2	1	1	...	...	...	...	...	...	...	...	...	...	18
Of Circulatory System.—Disease of the Heart and Blood-vessels	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	2
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	2	...	...	...	...	2	1	...	...	...	1	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	6
Of Urinary Organs.—Diseases of the Kidneys, &c.	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	2
Of Generative Organs.—Childbirth, Diseases of the Uterus	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	2
Of Integumentary System.—Diseases of the Skin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
Old Age	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	..	...	...	...	...	2
External Causes.—Violence, Privation, and Intemperance	...	1	...	...	...	1	...	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Unspecified	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	2
Total from all Causes	17	10	6	2	3	38	6	3	3	5	7	4	6	3	3	2	4	3	5	...	1	...	...	...	...	...	93

CHRIS. ROLLESTON, Registrar-General.

MUSIC FOR THE PEOPLE.

We are highly gratified to observe, that an attempt is now making to establish a Society for the practice of Choral Music in this city. One of the principal objects we had in view in the establishment of this periodical, was to assist and encourage any feeble efforts that might be made by lovers of art, to create something like a feeling for the arts that refine and elevate this community. We take blame to ourselves that we have not paid more attention to this important part of our duty; but the truth is, that very few opportunities have been afforded where assistance has been possible.

It is somewhat remarkable, that a city containing 70,000 inhabitants, a very large proportion of whom are highly educated, and have been accustomed to exhibitions of art, both musical and pictorial, in England, should be content with the utter stagnation, in these matters, that exists here. It is certainly not occasioned by the want of taste, either for music or painting. The former accomplishment is nearly universally taught; pianofortes are found in almost every house of any respectability, and the large number of professors of music testify to the prevalence of the public enthusiasm. Vocal music, as well as instrumental, is also gaining ground; and we observe, that classes for the practice of part singing are increasing in number.

It is then, we think, a most favourable period to attempt to establish a Society in Sydney, similar in its scope and object to the Sacred Harmonic Society of London, and the various choral unions of the provincial towns in England. Our readers, many of them are acquainted, we doubt not, with the advantages these Societies have conferred on the communities in which they have been established; how large bodies of the working classes have been found to unite and pass their evenings in the practice of a delightful art, instead of wasting their time, their money, and their health in the tavern;—how institutions, for the relief of the sick and the destitute, have been supported for years from the receipts of the public exhibitions of their proficiency;—and how cordial and friendly feelings have been encouraged and sustained among the various classes of society.

When we read of the magnificent musical exhibitions that take place in England, it is impossible to repress some feeling of regret, that no echo of that glorious harmony can ever reach these shores. Next year the Great Handel Commemmoration will take place in the Crystal Palace, at which it is expected that there will be many thousands of voices engaged. This grand idea was only rendered possible of fulfilment by the efforts which have been made for some years past by the Sacred Harmonic Society of London, who have already held two great festivals as rehearsals, when 2,500 voices united in the chorusses.

We are sadly in want of some additional means of recreation in this community. It is true that we have a fine climate, matchless pleasure grounds, and generally speaking, a reasonable amount of leisure; but these though they afford opportunities for individual enjoyment, do not tend to promote social and home pleasures. What is chiefly wanted, is something to make home attractive, and thus to eradicate the wide-spread propensity to find amusement in the tavern or the theatre. It is because we believe that vocal music is capable of affording these family pleasures, that we cordially recommend to the notice of our readers the prospectus of the Sydney Vocal Harmonic Society.

The constitution proposed is eminently liberal; there is to be no sectarian exclusiveness, but all are free to become members, without any other test of eligibility than the possession of a respectable character. The music to be studied will not be sacred music alone, but will comprise specimens of secular and operatic music, in which all can combine.

We trust if this Society is supported as it ought to be, that it will have the effect of attaching our population more firmly to the land of their adoption. It is painful for those true colonists who have made up their minds to live and die here, to see so many of those, who have succeeded in obtaining wealth, leaving the shores from which it has been extracted, and impoverishing the country that has made them wealthy. No doubt the attractions that older communities offer will always be very great; but it is quite time that we set about an attempt to rival them, or else New South Wales, for years to come,

must be content to be regarded as a sort of fattening farm for Europeans, who come out here lean and poor, get fat and rich, and go home to aggrandise the already overgrown wealth of England.

There is still some hope for New South Wales in the attachment of those who are born upon its soil; every year their numbers increase, and their love of country gathers force. If they are wise they will assist, with all their hearts, the establishment of Societies for the encouragement of the arts and the education of the people, for these form the standard by which the true worth of nations is measured.

SCIENCE AS A BRANCH OF EDUCATION,

BY SIR MICHAEL FARADAY, L.L.D., F.R.S.

The development of the applications of physical science in modern times has become so large and so essential to the well-being of man that it may justly be used, as illustrating the true character of pure science, as a department of knowledge, and the claims it may have for consideration by governments, universities, and all bodies to whom is confided the fostering care and direction of learning. As a branch of learning, men are beginning to recognize the claim of science to its own particular place;—for, though flowing in channels utterly different in their course and end to those of literature, it conduces not less, as a means of instruction, to the discipline of the mind; whilst it ministers, more or less, to the wants, comforts, and proper pleasure, both mental and bodily, of every individual of every class in life. Until of late years the education for, and recognition of, it by the bodies which may be considered as giving the general course of all education, have been chiefly directed to it only as it could serve professional services,—namely, those which are remunerated by society; but now the fitness of university degrees in science is under consideration, and many are taking a high view of it, as distinguished from literature, and think that it may well be studied for its own sake,—*i. e.*, as a proper exercise of the human intelligence, able to bring into action and development all the powers of the mind. As a branch of learning, it has (without reference to its applications) become as extensive and varied as literature; and it has this privilege, that it must ever go on increasing. Thus it becomes a duty to foster, direct, and honour it, as literature is so guided and recognized; and the duty is the more imperative, as we find by the unguided progress of science and the experience it supplies, that of those men who devote themselves to studious education, there are as many whose minds are constitutionally disposed to the studies supplied by it, as there are of others more fitted by inclination and power to pursue literature. The value of the public recognition of science as a leading branch of education may be estimated in a very considerable degree by observation of the results of the education which it has obtained incidentally from those who, pursuing it, have educated themselves. Though men may be specially fitted by the nature of their minds for the attainment and advance of literature, science, or the fine arts, all these men, and all others, require first to be educated in that which is known in these respective mental paths; and when they go beyond this preliminary teaching, they require a self-education directed (at least in science) to the highest reasoning power of the mind. Any part of pure science may be selected to show how much this private self-teaching has done, and by that to aid the present movement in favour of the recognition generally of scientific education in an equal degree with that which is literary; but perhaps electricity, as being the portion which has been left most to its own development, and has produced as its results the most enduring marks on the face of the globe, may be referred to. In 1800 Volta discovered the voltaic pile; giving a source and form of electricity before unknown. It was not an accident, but resulted from his own mental self-education: it was, at first, a feeble instrument, giving feeble results; but by the united mental exertions of other men, who educated themselves through the force of thought and experiment, it has been raised up to such a degree of power as to give us light, and heat, and magnetic and chemical action, in states more exalted than those supplied by any other means. In 1819 Oersted discovered the magnetism of the electric current, and its relation to the magnetic needle; and as an immediate consequence, other men, as Arago and Davy, instructing themselves by the partial laws and action of the bodies concerned, magnetized iron by the current. The results was so feeble at first to be scarcely visible; but, by the exertion of self-taught men since then, they have been exalted so highly as to give us magnets of a force unimaginable in former times. In 1831 the induction of electrical currents one by another, and the evolution of electricity from magnets was observed,—at first in results so small and feeble, that it required one much instructed in the pursuit to perceive and lay hold of them; but these feeble results, taken into the minds of men already partially educated and ever proceeding onwards in their self-education, have been so developed as to supply sources of electricity independent of the voltaic battery or the electric machine, yet having the power of both combined in a manner and degree which they, neither separate nor together, could ever have given it, and applicable to all the practical electrical purposes of life. To consider all the departments of electricity fully, would be to lose the argument for its fitness in subserving education in the vastness of its extent; and it will be better to confine the attention to one application, as the electric telegraph, and even to one small part of that application, in the present case. Thoughts of an electric telegraph came over the minds of those who had been instructed in the nature of electricity as soon as the conduction of that power with extreme swiftness through metals was known, and grew as the knowledge

of that branch of science increased. The thought, as realized at the present day, includes a wonderful amount of study and development. As the end in view presented itself more and more distinctly, points at first apparently of no consequence to the knowledge of the science generally rose into an importance which obtained for them most careful culture and examination, and the almost exclusive exercise of minds whose powers of judgment and reasoning had been raised first by general education, and who, in addition, had acquired the special kind of education which the science in its previous state could give. Numerous and important as the points are, which have been already recognized, others are continually coming into sight as the great development proceeds, and with a rapidity such as to make us believe that much as there is known to us, the unknown far exceeds it; and that, extensive as is the teaching of method, facts, and law, which can be established at present, an education looking for far greater results should be favoured and preserved. The results already obtained are so large as even in money value to be of very great importance;—as regards their higher influence upon the human mind, especially when that is considered in respect of cultivation, I trust they are, and ever will be, far greater. No intention exists here of comparing one telegragh with another, or of assigning their respective debts, merits, or special uses. Those of Mr. Wheatstone are selected for the visible illustration of a brief argument in favour of a large public recognition of scientific education, because he is a man both of science and practice, and was one of the very earliest in the field, and because certain large steps in the course of his telegraphic life will tell upon the general argument. Without referring to what he had done previously, it may be observed that in 1840 he took out patents for electric telegraphs, which included, amongst other things, the use of the electricity from magnets at the communicator,—the dial face,—the step-by step motion,—and the electro-magnet at the indicator. At the present time, 1858, he has taken out patents for instruments containing all these points; but these instruments are so altered and varied in character above the former that an untaught person could not recognize them. The changes may be considered as the result of education upon the one mind which has been concerned with them, and are to me strong illustrations of the effects which general scientific education may be expected to produce. In the first instruments powerful magnets were used, and keepers with heavy coils associated with them. When magnetic electricity was first discovered, the signs were feeble, and the mind of the student was led to increase the results by increasing the force and size of the instruments. When the object was to obtain a current sufficient to give signals through long circuits, large apparatus were employed, but these involved the inconveniences of inertia and momentum; the keeper was not set in motion at once, nor instantly stopped; and, if connected directly with the reading indexes, these circumstances caused an occasional uncertainty of action. Prepared by its previous education the mind could perceive the disadvantages of these influences, and could proceed to their removal; and now a small magnet is used to send sufficient currents through 12, 20, 50, 100, or several hundred miles; a keeper and helix is associated with it, which the hand can easily put in motion; and the currents are not sent out of the indicating instrument to tell their story, until a key is depressed, and thus irregularity contingent upon first action is removed. A small magnet, ever ready for action and never wasting, can replace the voltaic battery; if powerful agencies be required, the electro-magnet can be employed without any change in principle or telegraphic practice; and as magneto-electric currents have special advantages over voltaic currents, these are in every case retained. These advantages I consider as the results of scientific education, much of it not tutorial, but of self; but there is a special privilege about the science-branch of education, namely, that what is personal in the first instance immediately becomes an addition to the stock of scientific learning, and passes into the hands of the tutor, to be used by him in the education of others, and enable them in turn to educate themselves. How well may the young man entering upon his duties in electricity be taught by what is past to watch for the smallest signs of action, new or old; to nurse them up by any means until they have gained strength; then to study their laws, to eliminate the essential conditions from the non-essential, and at last, to refine again, until the encumbering matter is as much as possible dismissed, and the power left in its highly developed and most exalted state. The alterations or successions of currents produced by the movement of the keeper at the communicator, pass along the wire to the indicator at a distance; there each one for itself confers a magnetic condition on a piece of soft iron, and renders it attractive or repulsive of small permanent magnets; and these acting in turn on a propelment, cause the index to pass at will from one letter to another on the dial face. The first electro-magnets, *i.e.*, those made by the circulation of an electric current round a piece of soft iron, were weak; they were quickly strengthened, and it was only when they were strong, that their laws and actions could be successively investigated. But now they were required small, yet potential. Then came the teaching of Ohm's law; and it was only by patient study under such teaching that Wheatstone was able so to refine the little electro-magnets at the indicator as that they should be small enough to consist with the fine work there employed, able to do their appointed work when excited in contrary directions by the brief currents flowing from the original common magnet, and unobjectionable in respect of any resistance they might offer to the transit of these tell-tale currents. These small transitory electro-magnets attract and repel certain permanent magnetic needles, and the to-and-fro motion of the latter is communicated by a propelment to the index, being there converted into a step-by-step motion. Here everything is of the finest workmanship; the propelment itself requires t-

be watched by a lens, if its action is to be observed; the parts never leave hold of each other; the vibratory or rotatory rachet wheel and the fixed pallets are always touching, and thus allow of no detachment or loose shake; the holes of the axes are jewelled; the moving parts are most carefully balanced,—a consequence of which is that agitation of the whole does not disturb the parts, and the telegraph works just as well when it is twisted about in the hands, or placed on board a ship or in a railway carriage, as when fixed immovably. When it is possible, as in the vibratory needle, the moving parts are brought near to the centre of motion, that the inertia of the portion to be moved, or the momentum of that to be stopped, should be as small as possible, and thus great quickness of indication obtained. All this delicacy of arrangement and workmanship is introduced advisedly; for the inventor, whom I may call the student here, considers that refined and perfect workmanship is more exact in its action, more unchangeable by time and use, and more enduring in its existence, than that which being heavier must be coarser in its workmanship, less regular in its action, and less fitted for the application of force by fine electric currents. Now there was no accident in the course of these developments;—if, there were experiments, they were directed by the previously acquired knowledge;—every part of the investigations was made and guided by the instructed mind. The results being such (and like illustrations might be drawn from other men's telegraphs or from other departments of electrical science), then, if the term education may be understood in so large a sense as to include all that belongs to the improvement of the mind either by the acquisition of the knowledge of others or by increase of it through its own exertions, we learn by them what is the kind of education science offers to man. It teaches us to be *neglectful* of nothing;—not to despise the small beginnings, for they precede of necessity all great things in the knowledge of science, either pure or applied. It teaches a continual comparison of the *small and great*, and that under differences almost approaching the infinite: for the small as often contains the great in principle as the great does the small; and thus the mind becomes comprehensive. It teaches to deduce principles carefully, to hold them firmly, or to suspend the judgment:—to discover and obey *law* and by it to be bold in applying to the greatest what we know of the smallest. It teaches us first by tutors and books to learn that which is already known to others, and then by the light and methods which belong to science to learn for ourselves and for others;—so making a fruitful return to man in the future for that which we have obtained from the men of the past. Bacon, in his instruction, te ls us that the scientific student ought not to be as the ant who gathers merely, nor as the spider who spins from her own bowels, but rather as the bee, who both gathers and produces. All this is true of the teaching afforded by any part of physical science. Electricity is often called wonderful—beautiful;—but it is so only in common with the other forces of nature. The beauty of electricity, or of any other force, is not that the power is mysterious and unexpected, touching every sense at unawares in turn, but that it is under *law*, and that the taught intellect can even now govern it largely. The human mind is placed above, not beneath it; and it is in such a point of view that the mental education afforded by science is rendered supereminent in dignity, in practical application, and utility; for, by enabling the mind to apply the natural power through law, it conveys the gifts of God to man.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

TWENTY-SECOND MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange.

Tuesday, November 2nd, 1858.

Members of Council present:—The President, Messrs. Dyer, Burnell, McDonell, Walker, Captain Ward, and W. Deane, Honorary Secretary.

His Excellency the Governor-General, President, in the Chair.

Minutes of last meeting read and confirmed.

PAPERS READ.

The President read a paper on the supply of animal food to the inhabitants of New South Wales.

In answer to a question asked by Mr. G. K. Holden, the President stated that he did not think it would be worth while fattening on the runs on account of the distance from the market, and that in Van Dieman's Land, the farmers grew roots for their cattle.

Mr. J. H. Williams spoke of the capabilities of land to the southward of Wollongong, for fattening cattle, particularly mentioning the Terrara Station.

The President asked Mr. Williams if he knew the time it took to fatten stock on the Terrara run. To which Mr. Williams replied, that he believed that two months would be sufficient to fatten them for the butcher, and that one acre of clover would fatten two bullocks, but that in America an acre of grass would be sufficient for four cows.

The President then stated that he thought in ten years time there would not be found enough grass to fatten the requisite number of stock for the wants of the people, and strongly advocated stall feeding as a means to make up the difficiency of indigenous fodder plants.

The Secretary read a paper from Mr. R. Meston, New England, on Brief Notices of several Insects detrimental to animal and vegetable substances.

The President asked if any of the members had taken notice when the Aphis left. He had observed them to leave his garden three days before the late rain, and had not a single Aphis in the garden at the present time, they went off to the vines and from thence took their departure in one night.

Mr. Walker said that his gardener informed him, that they went from his garden during the rain.

The President stated, that he had tried every thing he could think of to destroy them including oil and soot, but without avail.

LETTER READ.

The Secretary read a letter from Mr. Joseph Dyer, which was accompanied with a quantity of seeds from Western Australia, with a request that the same should be distributed among the members.

The President in the name of the Society thanked Mr. Dyer for his kind donation.

A vote of thanks was proposed, seconded and carried by acclamation to His Excellency the Governor-General and Mr. R. Meston, for the valuable papers which had been read during the evening.

NOTICE OF PAPER FOR NEXT MONTH.

Mr. W. Redman on the necessity of Roads to keep pace with the necessities of Agriculture wherever public lands are disposed of.

The next monthly meeting will be held on Tuesday, December 7th.

NOTES ON THE SUPPLY OF ANIMAL FOOD FOR THE INHABITANTS OF NEW SOUTH WALES AND VICTORIA.

On looking over the statistical returns for 1856, I was struck with the result exhibited in the table showing the amount of stock in the colony, which appeared to indicate a decrease in the number of sheep difficult to be accounted for—except upon the supposition of a large exportation, across the Murray, for the supply of the rapidly increasing population of Victoria.

I have just had the opportunity of examining the returns for 1857, which gave the results up to the commencement of the present year, and also the returns from Victoria which carry their statistical accounts up to 31st March of the present year. As the two colonies may, as regards the supply of animal food, be looked upon as one community, I have thought that a combination of the figures and facts exhibited in the returns of both would prove interesting, not only to the Agricultural Society but to the colony at large, as bearing upon a question in which every one who is a consumer of animal food are deeply concerned.

The returns to which I have alluded show the number of the population and of the cattle and sheep as in the table below—

	Cattle	Sheep	Pop.
New South Wales	2,148,664	8,139,162	305,487
Victoria.....	614,537	4,766,022	469,637
Total..	2,763,201	12,905,184	775,124

Now cattle may be killed off at the rate of one-sixth,—or say 16 per cent., annually allowing for an increase at the rate of six per cent.—that is to say, out of 1000 head of cattle, 160 may be killed annually, and yet at the end of the year there will be 1060 head in the herd.

In the same way as regards sheep, the same proportion of 16 per cent. may be killed, and yet there will be an increase of 5 per cent. in the stock.

If now an application be made of these facts, which I believe will be allowed to be a favorable statement of the capabilities of both cattle and sheep, it will be found that 460,533 head of cattle may be slaughtered annually, and yet that the numbers would increase to the extent of 165,792 head; and out of 12,905,184 sheep, 2,150,864 may be killed, and yet at the end of the year there would be an increase of numbers to the extent of 645,259.

On reference to the butchers and others competent to give opinion upon such subjects, the average weight, and that rather high than otherwise, of bullocks in the Sydney market may be put at 600 lbs., and 460,533 head of cattle at 600 lbs. each, would give 276,319,800 lbs. of meat,—in the same way, 2,150,864 sheep at 50 lbs. will yield 107,543,200 lbs.; making a total of 383,860,000 lbs.—this weight divided amongst the gross popula-

tion of 775,124, will give somewhat less than 500 pounds to each annually, or about 9½ lbs. for each individual per week.

The average ration given to shepherds and others varies from 10 to 12 lbs. per week, but as in the return of the population, women and children are included, it is probable that the supply of meat is at present adequate to the wants of the population, and will increase at the rate of 165,792 cattle, and 645,259 sheep, in the course of the present year.

Of this increase one sixth, or 27,632 cattle, and 107,543 sheep, will be available for the butcher, and this number at the weight given before will produce 21,986,350 lbs. of meat, or annual food for about 44,000 people.

From the returns of the population of the two colonies of New South Wales and Victoria, it appears that in the course of the year 1857, there have been additions to the population to the extent of 18,614 in the former colony, and of 58,871 in the latter; making the total increase 77,481—a number exceeding by 33,481, that for which the ordinary and regular increase of stock will furnish annual food, if therefore we assume that the population will continue to increase in anything like the same proportion in the present and future years, it is evident that one of two things must happen. Either the population must be content with a smaller supply of animal food than it has been accustomed to consume, or a larger proportion of cattle and sheep must be killed; the result of which would be a diminution in the rate of increase of stock, and an enhancement of the evil which the colonists have to dread. I may observe, that the rate of increase which I have taken both for cattle and sheep, is in excess of that, which a comparison of the returns for the last ten years will give, taking good seasons and bad, the average annual increase of cattle has been about 5 per cent., and that of sheep 2½ per cent., while the weight, which I have assumed as the average for cattle and sheep, is admitted to be in excess of the reality.

I may also observe, that there is a regular export both of cattle and sheep to Tasmania, for the supply of the population there.

I believe then, that I have, if anything, underrated the deficiency which is likely to occur, and to which I wish to call the serious attention of the stockowners and of the public at large.

It may be said, perhaps, that by turning attention to breeding cattle, from which a greater supply of meat from the same area of ground may be expected, this evil will be, at all events, postponed; but, in the first place, a large proportion of the runs which are available for sheep, are not fit to carry larger stock, and as it is more profitable to the flock-owner, when the run is favourable, to stock it with sheep, it will not be his interest to make the change until the time arrives when the increased price of meat may make it worth his while to alter his grazing arrangements; besides, as the consumption of meat has already been shown to be in advance of the natural and regular increase, it will be difficult to find cattle to substitute for sheep, even should the pasturage be fit for them. The same remark may be made to any suggestion to increase the number of sheep, and besides, I believe, that the whole of the pasturage within any reasonable distance of the great markets of Sydney and Melbourne, is fully stocked, when I say fully stocked I mean up to the measure of its present grazing capabilities—how then is the evil to be met? It is evident that if the stock of all kinds is killed faster than it can increase, the deficit will become more pressing day by day; that even if it be allowed to carry out its ordinary rate of increase, the demand for meat will get more and more urgent, so long as the population adds to its numbers in a ratio in excess of that at which the stock increases. The only mode in which there appears a prospect of overcoming the difficulty which is becoming every day of greater and greater importance is by adding to the weight of the stock, by providing better and more abundant food, by changing the breed of sheep, substituting as in England, an animal with a coarser fleece and a heavier carcase for the present fine woolled varieties, making up for the depreciation in the quality of the wool by its quantity, and by increased value of the carcase, in the same way by paying attention to the breed of

cattle it might be easy to add fifty per cent. to the weight of the carcase, but the first step must be to improve the paying capabilities of the ground. It would be useless to turn the best bred animal upon a pasture where the food was so scanty as to compel it to travel miles before it must satiate its appetite or from which it must roam several miles in search of water. If an animal is to get at its food it must be brought within easy reach, and this can never be the case except under very favorable circumstances upon the natural pastures of the colony.

I have brought this subject under the notice of the members of the Agricultural Society, believing it to be one in which they are deeply interested. I have given the facts as deduced from the returns furnished to the Government, and although there may be some slight errors in the positive amounts given, yet, I believe, that the relations or proportions of the numbers given in one year to those of the following years is correct enough to bear out fully the inferences I have drawn. I trust that the practical agriculturists and stock owners will now turn their attention towards the improvement of the pastures of the country, and thus place themselves in a position to meet the constantly increasing demand which is certain to be made upon them.

W. DENISON.

BRIEF NOTICES OF SEVERAL INSECTS DETRIMENTAL TO ANIMAL AND VEGETABLE SUBSTANCES.

When present at a monthly meeting of your Society on the evening of November 3, 1857, particular notice was taken by me of a motion made by Mr. Miles, for appointing a Committee to enquire into, and to endeavour to investigate, the causes by which all young cabbages in and around Sydney and numerous other places were damaged and in many cases destroyed. A feeling seemed to prevail in the members' minds who were present that any such Committee would do no good. In this colony we are nearly all working men, either with heads or hands, or both. Each is therefore actively engaged in attending to his own particular business. But for that reason investigation is not to be wholly neglected; let every man resolve himself into an Experimental Committee of his own, and one wiser or more fortunate than his compeers may discover some cheap and effective remedy or remedies which may benefit himself and all the Colony, thus acquiring a memorial more lasting than either tablets of granite or monuments of marble can transfer to posterity. In conformity with this view, your co-member will state the results of his own experience, occasionally adding what other observations he may have noted or picked up on his way. Pretending to small knowledge in entomology, should any mistakes in his nomenclature be committed, he will feel pleased to see his errors mildly corrected. Great are the plagues of numerous insects to gardeners and farmers; they constitute some of the most voracious and destructive foes to the vegetable kingdom, and the worst plagues to overcome and destroy of any other order in our terraqueous globe. The ravages of some insects, as the locust, have been subjects for all histories. Fortunately, these destroyers never visited Britain or Australia in very formidable numbers; but the wheat and turnip flies commit fearful injuries to these valuable crops, both in Albion and in America. As yet, these insects have not increased in this colony so as to make their presence felt. But the time approaches when farmers will grievously feel them for we have got the breeds.

The number of insect tribes is legion. Mr. Macleay supposes 100,000 different species. DeCandole computes six varieties to every phanerogameous plant. As these are estimated at nearly 100,000, the insect list would thus swell to 600,000. The sum of species collected in cabinets of the curious exceed rather 100,000, according to good authorities.

Many persons will remember the ravages of 1844 by caterpillars, and also the waste of pastures of the Barwon, and other places, at various times, by grasshoppers, as they were called, but truly a species of locust *(gryllus)*. These insects are supposed to return periodically. Definite kinds of butterflies are said to appear around London only every third or fourth year. Others will not be seen during nine or ten seasons; a few come constantly to one country and at intervals to another. Locusts themselves are supposed to return unto the same countries or regions once every seventeen years. Whether their eggs, like vegetable seeds, lie dormant for seasons without hatching, until some extraordinary coincidences of heat, moisture, and electricity, awaken them into existence, or whether their fecundity for a time is exhausted, and years are required for re-multiplication of the race, are propositions rather pertaining to the naturalist than constituting a source of study for the practical man. One conclusion is clear, that increased heat accelerates, and cold retards, the multiplication of all insects whatever.

Amongst the plagues of flies injurious to man and peculiar to animal matter, is the *Musca carnarea*, or blow-fly, an affinity of the *Musca domestica*, or house fly. These, instead of depositing eggs, bring forth their larvæ in the form of footless grubs, and hence are denominated viviparious, similar to vipers and various reptiles. The great fecundity of these flies increases them in vast numbers, and scarcely two weeks elapse from the birth of one generation until millions all are occupied in the work of multiplication. Naturalists state, that a single blow-fly will give birth to 20,000 larvæ in a single season. During warm weather they are the sources of constant annoyance to all careful housekeepers and butchers, and although they perform great services as some of nature's scavengers—by consuming putrid animal matter and carrion, yet their over anxiety in this way makes no distinction between what is good and what may be bad.

It is a curious fact, says the *Courier de Lyons*, that the butchers of Geneva are never troubled with these flies. Their shop walls they rub over with *laurel oil*, which is an effectual preventive. The *Courier de Havre* reports, that no fly will enter those apartments in which wreaths of walnut leaves are suspended. Of these deterger[illegible] the writer cannot say for either, *probatum est*, b

as Mr. Allan, of Sydney, advertised of his soap, there can be no harm in trying them, soap and all, if people choose.

Many fly-poison recipes are given; some inconvenient, others dangerous, few effective. No doubt such things can be found in *rerum naturæ* as fly-expellers; ergo, let us search for them. Hereditary antipathies are equally strong as hereditary instincts. Nutmegs will expel mites from cheese by the smell. Chips of our own myal will prevent moths from attacking woollen clothes when the shavings are placed amongst them. No flies, some one writes, will touch a magnet or suspended magnetized bar. In some places they burn dogwood to drive away mosquitoes; but between the offence to noses by the stench, and annoyance to eyes by smoke, it is doubtful if the remedy is not equally bad as the mosquito sting. The smell of tar is very offensive to various moths and butterflies, and lime, also salt, are very injurious to all insects having tender skins; so are acrid waters, as tobacco-waters, soot, lime-water, salt-water, aqueous ammonia, &c. Tar and its preparations always formed the editor's remedy when annoyed with caterpillars. Animal urine poured round the stems of trees and bushes will preserve them for a year or two from caterpillars. By digging the earth deep in winter around your trees or shrubs, the insects will be buried beyond their vivifying depth. Sprinkling with tar-water in Spring prevents the fly or moth from depositing its eggs. One pound soft soap, with a quarter pound of tobacco boiled in forty pints of water, if applied milk-warm, with a hand squirt in the evening, will prove very effective.

The sawfly, so called from a saw like apparatus, it possesses for slitting the bark of trees or shrubs when depositing its eggs, is the most destructive to the vegetable kingdom of any insect belonging to the Hymenoptera family, meaning four winged insects armed with piercers. Roses, currants, cherries, &c., are often completely stripped of leaves, by various species of the sawfly. This denudation people often attribute to blight, a very indefinite word which suits all occasions of this kind, as well as Esquire, in its way. Blight, bad enough, the evil is found, but proceeding from insect depradation. The grubs of these saw flies may be distinguished from the catterpillars of moths and butterflies, by the singular position those of the first assume when at any time disturbed. They then coil themselves up in spiral forms, with heads in centres, lying motionless on their sides—occasionally they may be seen throwing out their bodies almost parallel to the horizon. Falls of rain they cannot endure. Hence we infer, that artificial imitations would prove nearly as detrimental as the real, and when tried by force pumps and other means, the effects verified the expectations.

Fumigations with sulphur have also proved very effective in cases.

A very destructive insect is the cock-chaffer. Its larvæ, known as the white worm, commit great ravages on the roots of grasses, and most other roots, during not less than four years, the usual period of existence in that state while burrowing under the earth's surface. In Autumn, they descend deeper and lie in a torpid state, during the colder season when spring returns, they commence their work of destruction, undermining and cutting up cabbages and other garden stuffs; indeed the roots of few plants escape, one time or other from their attacks. This grub is very destructive to cereal crops. Because rooks devour these larvæ, the cawing birds are great favourites with farmers in Britain. Five young ones with the parent pair, are reckoned adequate to pick up annually about 20,000 grubs. But in Australia we some how have unfortunately got more than enough of the carrion-crow, but neither rooks nor jackdaws. In cultivated fields, these grubs often creep out of the soil and cut down the young briard. In such cases, night rolling with a heavy stone roller is successfully applied and myriads crushed by this method, which method Mr. M. frequently put in practice, carrying a lanthern in one hand and leading the horse with another, taking turns with the servants. In gardens, the various composts of soaper's waste and earth, or quicklime and salt, or either of the last two separate, dug into the ground, will kill these naked grubs.

The mischief, however, done by these larvæ, ends not quite with their change into the fly. The greater part of insects eat very little after arriving at their third or last transformation. To perpetuate their species seems the great aim of their more mature existence. This business they pursue with indefatigable ardour, and as soon as their eggs are deposited they quickly waste away or die. Not so speedily the cock-chaffer quits; when in their best state they congregate in numbers and issue forth about sunset to devour every green leaf. By the termination of eight days or thereby, the females dig holes in the earth, about half a foot deep, deposit their eggs, cover them up, and retiring to tree or bush, become languid,—and *then* finally perish.

Ravages of the *seolytus destructor* or bark beetle are too plain through the forests, to escape notice from the most inconsiderate. These insects feed between wood and bark—destroy the proper adhesion—and annihilate their functions. The destructor's track may be very plainly seen, when the bark falls off in pieces and the tree and timber dies. No remedy has yet been made known to tell in what way this destructor indeed, may be destroyed, or its ravages prevented.

It would be impossible, in a single paper, to take a cursory notice only, of the most common insect plagues, without running into inconvenient lengths. The subject of weevil alone, *curculio granaria*, to the expulsion and extermination of which from corn deposits, Mr. Meston devoted much time and tried many experiments, would require a short treatise of itself. The families of aphis and of cocus, however, demand more than common attention, both on account of their numbers, and also for the evils they occasion to vegetation in such latitudes as those of Australia. The cabbage blight, so generally a matter of grievance, may be plainly traced to a species of aphis, in the first stages; as stated by Mr. Creswick. Mother earth has been prodigal of her insect progenies, during the past season; a consequence which might have been predicted from the climatic conditions of the previous year. But we had more to complain of in New England. The cabbages were cut off when nearly at maturity, by hot winds; rather unusual in this elevated table land, during the last week of 1857, and the first days of January, 1858.

Another communication on this subject will probably exhaust all the writer's stock of information on these checks to human industry. Willing, however, to ask and receive as to give the results of experience, he hopes that other members will come forward as readily, and report to the Society as freely.

One good hint, having the guarantee of sound practical observation, may be worth a treasure. The units of individual information added to the

sum of collective knowledge, will soon constitute a considerable total, and the monthly meetings of your society, are admirably calculated to facilitate interchanges of practical suggestions; the more valuable, should they bear the impresses of colonial utility, as so much the better adapted for the peculiar climatalogy of the Australias, whether east, west, north or south. The stores of nature are unbounded, and thousands of new discoveries to be yet made, if we possess the heads and application to endeavour searching out, and trying to find them.

R. MESTON.

St. Leonard's, North Shore,
6th January, 1857.

To the Honorary Secretary of the Horticultural and Agricultural Society.

SIR,—In the conviction that every member should give information which in his opinion may conduce to forward the objects of the society, and through it, the public advantage, I submit for the inspection of the meeting, a plant of the Nohl Kohl, or Turnip Cabbage; grown under the disadvantage of having been sown on ground newly broken, very poor, being chiefly decomposed ironstone, with a thin topping of vegetable mould. Under more favorable circumstances, I have no doubt but that the results of the cultivation of this plant would be satisfactory either in private gardens, or in those used to supply the public.

I had the seed from A. T. Holroyd, Esq., a gentleman, whose ample means and liberal disposition, enable and induce him to import from England, and from the Continent of Europe, anything of superior excellence in its kind, whether vegetable or animal.

The seed should be sown in a bed of good earth and set out, when of the usual size of cabbage plants, in well manured ground, allowing 2 feet from plant to plant, every way:—the growth is rapid, and they may be pulled when 4 or 5 inches diameter at the thickest part, when each bulb will give a common covered dish full of excellent vegetable in taste something similar to the sweet potato, but of firmer consistency.

Our way of dressing them is, when young, to cut off the shoots from the top and sides, (which shoots are quite equal to cabbage sprouts for the table) and boil the bulb whole—and, when, like a potato it can be easily pierced with a fork, it is done, and the fibrous skin will readily separate: when older, they should be pared clean from the woody fibre—cut into pieces about the size of the quarter of a large orange, and boiled soft as before—the gravy of roast meat is all they need—but with boiled meat, a little melted butter, or white sauce.

It is my intention to save seed from fine plants now coming to perfection, which seed I shall have much pleasure in leaving with the Honorary Secretary for distribution to any of the members who may be desirous of giving the plant a trial.

This bulb exceeds 8lb. in weight but for general use they should be pulled when from 4 to 5 in diameter, which size they will attain in good ground in about 12 weeks.

RICHARD GARRETT.

No. 25, Macleay-street, Woolloomooloo.
September 30, 1858.

To W. H. WEBB, Esq.,
Secretary to the Horticultural Society.

DEAR SIR,—A gentleman who has recently visited King George's Sound has kindly brought me thence a collection of seeds indigenous to that place. They are all arranged and named. Thinking that some of our Horticulturists may be desirous to experiment upon them, I beg to present them to the Society, and shall be glad to hear that they have been distributed to any one who may wish to plant them.

The thoughtfulness of my friend has suggested to my mind, that persons travelling in distant countries might, perhaps, confer a valuable service on the colony by forwarding seeds of such plants as may seem to them worth cultivating, an instance of which occurred in the introduction of the Sorghum by Mr. Deas Thomson. I trust his example will be widely followed.

I am, dear Sir,
Your obedient Servant,
JOSEPH DYER.

PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

November 10th. — Twenty-second Monthly Meeting of the Philosophical Society of New South Wales, held in the Sydney Exchange. His Excellency Sir W. T. Denison, K.C.B., in the Chair.

J. S. Willis, Esq., was duly elected an ordinary member.

One new candidate was proposed and seconded.

The Rev. William Scott then read a paper "on the Plurality of Worlds."

A conversation ensued on the above subject, in which the President, the Rev. William Scott, Professor Smith, Messrs. Alfred Roberts, T. Cape, H. C. Burnell, and Edward Drury took part.

The Chairman then read the result of an examination of Coal from Bellambi, made at the Royal Branch Mint.

Three numbers of "the Wonders of the Microscope Photographically Revealed" by Olley's Patent process were laid upon the table for the inspection of the members by Messrs. Brush and MacDonnell.

Mr. T. F. Cape laid before the society a volume of the "Transactions of the National Association for the promotion of Social Science."

The President then reminded the members that there would be Photographic Conversation at the next meeting of the society, and announced that on that occasion Members would have the privilege of introducing the ladies of their families.

ON THE METEOROLOGY OF NEW SOUTH WALES, No. 2.

By the Rev. W. Scott, Read August 11th, 1858.

In the paper which I read to this Society in October last, I promised to give from time to time, some account of the working of the meteorological observations, then being established in the colony, and of the results deduced from their observations.

This promise I now endeavour to some extent, to fulfil. From the printed returns which I now lay on the table, it will appear that a change has been made in the list of places selected for observatories.

Gabo Island having been transferred to the territory of Victoria, the observations of the Light-house will be carried on under the superintendence of that government. I have also determined to abandon Newcastle as a station, and have accepted the offer of a gentleman on the Richmond River, Dr. Barker of Ettrick, who has volunteered to take charge of one set of instruments. The list of stations therefore stand, thus—in order of latitude; Cape Moreton, Ettrick, Armidale, Maitland, Bathurst, Parramatta, Sydney, Goulburn, Deniliquin, Albury, Cooma.

The substitution of Richmond River for Newcastle is a decided improvement, as helping to fill up the great interval in latitude between Cape Moreton and Armidale; and I hope, at no distant period, when I shall have recovered the set of instruments now at Gabo Island, or another set in their place, to add to the list a station much farther to the north, perhaps within the Tropic of Capricorn.

The result of any experience in transmitting instruments and establishing observatories at country stations is as follows:—

Barometers, with glass cisterns, can be carried to any part of the country with safety if only ordinary care is taken to protect them against very violent shocks, such as the overturning of drays, or throwing the cases carelessly on the ground in unloading. This is sufficiently proved by the fact that only one of the eleven has been broken, and that one under the very unfavorable circumstances mentioned in my last paper.

The conveyance of the other instruments, if carefully packed, is altogether free from danger.

Several of the thermometers have, however, been broken since their arrival from want of sufficient care on the part of the observers, most of whom are unaccustomed to handle such delicate instruments.

This will account for the various blanks in the columns of the Monthly Abstracts.

One black bulb thermometer has been broken by the expansion of the Mercury, from not having sufficient range for the great temperature to which it was exposed.

This oversight on the part of the makers, may serve as a caution to the purchasers of thermometers, to see that they have sufficient range for the highest temperature to which they are ever likely to be subjected; a precaution which instrument makers in colder countries are always liable to neglect.

It is complained also of some of the minimum thermometers that they fail to register the minimum temperature, and frequently get out of order, in consequence of the index sticking to the tube, and allowing the spirit to recede without it.

One of the black bulb thermometers fails to register the maximum temperature, the mercury receding with the decrease of temperature, instead of remaining at the highest point; this indicates that the tube is not sufficiently contracted to the point where the break in the mercurial column should be effected. These circumstances are rendered the more remarkable by the fact that all the instruments bear the certificate of the Greenwich observatory, where they were tested and compared with the standard thermometer; and I have thought it desirable to call particular attention to them as a caution to importers of instruments, as it is very disappointing to find on their arrival from England that they will not answer the purposes for which they were intended.

It will be seen on examining the printed tables that no returns are made of atmospheric electricity, as originally proposed. I have been led to abandon the idea of obtaining such returns, by the consideration, that there would be a very great probability of error in observations of the kind made by unskilled observers; and that even when correctly made, yet, being made only three times a day, they could scarcely throw any light on the questions which they are intended to illustrate.

Another set of observations commonly made at observatories I have determined to dispense with at all events for the present, namely the description of clouds.

Cloud observations in order to be of any real service must be continuous; their formation, their movements, their changes in character and magnitude, and their disappearance, must be closely watched in connection with the readings of the Hygrometer and the fluctuations of the wind; and the observer must be one who has given, and can still give, a considerable amount of time and attention to the subject; so that I am convinced that mere isolated statements made three times a day, of the description of clouds then visible, and that too by unskilled observers, would be of no real service whatever. The observations are conducted in accordance with the printed instructions some copies of which are laid on the table for such members as may wish to take them. These instructions are fully carried out with the above mentioned exceptions, and with the exception of Dew point observations with Daniell's Hygrometer, which are omitted for reasons mentioned in my last paper; the hourly observations on certain days, recommended in the instructions, cannot under existing circumstances be expected.

Monthly copies of the original observations being sent to me, the necessary reductions have then to be performed; these reductions involve no small amount of labour as some amongst us perhaps can testify. There are, or will be, twelve sets of observations every month, and one of their sets occupies me, who am probably a more rapid computer than ordinary, about four hours in reducing and copying the results.

The first thing to be done is to correct the Barometer reading to 32° Fahrenheit. The original reading is first corrected for Capillarity and Index Error, the amount of the latter having been determined for each Instrument by numerous comparisons with the Standard Barometer at Greenwich; the sum of these corrections varies in different Instruments from — ·007 to + ·021 of an inch.

The corrected reading is again corrected for temperature, by means of Glaisher's Tables constructed for that purpose. This important correction, varying from 0 to nearly ·2, of an inch, has frequently been neglected, as was the case with the observations made for so many years at the South Head.

The corrected readings for the three hours of observation occupy columns 2, 3, and 4, in the Table.

The next six columns give the direction and force of the wind. In registering the direction sixteen points only are used, and the force is expressed in numbers from 0 to 6, according to the observer's judgment as directed by the instructions.

From these six columns are deduced the results given in the lower table; namely the number of times that the wind has been observed to blow from each of the 16 directions; the sums of the forces, found by adding together the numbers assigned to the forces at each of those times; the resultant direction; and the resultant force. The two last are found by treating the forces as mechanical forces, and resolving them into their components, the north and east directions being taken as rectangular axes.

The results thus obtained are so far satisfactory, that they give us the means of comparing the general tendency of the winds, during the different months of the same year, or the same months of different years, at the same place, and during the same periods at different places; in the last case, however, we must not lose sight of the fact, that different observers may form different estimates of the force of the same wind; so that a comparison between the forces of the resultants for different places, may not give a true relation; the resultant directions, however, are not likely to be much affected by this personal discrepancy, as each observer may be expected in the long run to employ a scale of forces tolerably consistent with itself, however different from that used by another observer.

Another important point is that there are no observations made late in the night; this must lead to very considerable errors in places where the alternation of land and sea breezes is distinctly marked.

Suppose, for example, that during many days of the same month a sea breeze set in at 11 a.m., and continued until after 9 p.m., when a land breeze commenced and continued until 11 a.m. the next day; in the course of the 24 hours we should then have the force and direction of the sea breeze recorded twice but those of the land breeze only once, thereby giving an undue preponderance to the former.

This is a source of error which can scarcely be avoided, except by the use of self-registering Anemometers at all the stations, an arrangement which I see but little prospect of carrying into effect.

All that we can do at present is to make a sort of mental reservation in favour of any particular wind, which we may have reason to believe prevails throughout the year or month, during the interval between the 9 p.m. and 9 a.m. observations.

The resultant force as given in the table is deduced from the whole of the wind observations for the month; some interesting results might probably be obtained by applying the same process to the separate columns of observations for the three different hours. This and many other such computations I would gladly undertake had I but unlimited time at my disposal; at present they must be left to volunteers, if such can be found, to whom I would gladly afford any information and assistance that they might require.

In connection with the barometer and wind observations, I may mention that I have arranged to obtain extracts from the logs of ships visiting this port for the purpose of investigating the characteristics of any great storms by which we may be visited. The next six columns contain the readings of the dry and wet bulb thermometers in the shade, the former giving the temperature of the air, and the two combined affording data for determining the quantity of vapour and humidity of the atmosphere. These are followed by the readings of the self-registering maximum and minimum shade thermometers. The minimum reading is taken at 9 a.m., and, as the minimum temperature is almost always attained some hours after midnight, may be considered as belonging to the day on which it is taken, that day being reckoned as commencing at preceding midnight.

In taking the greatest diurnal range of temperature, as recorded in the lower table, each minimum reading is subtracted from the preceding and succeeding maximum; we thereby obtain not the greatest range in any day of the Calendar, but the greatest in any interval of 24 hours.

The result thus found may be of considerable importance in its bearing on sanitary questions; it may be that such great variations in temperature, as are experienced at some places in this country, are detrimental to health; yet the ill effects are in great measure obviated, by the circumstance, that at the time when the greatest depression of temperature occurs, most people are in their beds and well protected from the cold; and I question whether those places at which the Diurnal Range seems to be the greatest, namely Armidale and Deniliquin, are at all below the average as healthy residences; the changes in mean daily temperature from day to day have probably more effect on the health than the change from maximum to minimum temperature in any one day.

It is to be regretted that we have no means, at present or in prospect, of obtaining true mean monthly temperatures from the mean temperatures at the hours of observation.

Mr. Glaisher's tables, for determining mean monthly temperatures from the mean of observations made at any given hour being deduced from observations made at Greenwich, could not be expected to apply to this country. I had, however, the curiosity to apply them in several cases changing the months so as to adapt them to the southern hemisphere, and obtained the following results:—

Mean monthly temperature, from observations made at

		9 a.m.	3 p.m.	9 p.m.
Parramatta,	February, 1858..	71·1	67·6	69·3
Armidale,	„ „ ..	65·8	65·1	65·0
Bathurst,	„ „ ..	66·8	65·7	68·5
Goulburn,	„ „ ..	63·9	62·9	65·2
Albury,	„ „ ..	68·6	71·9	
Parramatta,	March, 1858..	69·5	65·4	66·2
Armidale,	„ „ ..	65·0	62·2	61·0
Bathurst,	„ „ ..	66·7	63·9	65·8
Goulburn,	„ „ ..	62·6	61·8	62·0

From these results some of which shew a difference of as much as 4 degrees it is evident that Mr. Glaisher's tables although intended apparently for great varieties of latitude cannot be used with any degree of security in this country.

It is not uncommon to take the mean of the maximum and minimum temperatures as the true mean for the day; the result thus obtained is in most cases somewhat too high, and we might perhaps approximate more nearly to the truth by taking one fourth the sum of the three daily observations and the minimum. This mean, for all the stations except Deniliquin, is less than the mean of the maximum and minimum, the difference ranging from one to three degrees.

In the case of Deniliquin, the mean of the four exceeds the other mean by more than a degree; owing probably to the great radiation of heat during the night from the open plains on which

it is situated, which causes the minimum temperature to fall much further than ordinary below the temperatures at the morning and evening observations.

All things considered I am inclined to think, that the mean of the four is the best mean that can at present be obtained, and I propose to adopt it as the true mean at all events until a better shall be pointed out.

The next column contains the readings of a Maximum Thermometer with blackened Bulb exposed freely to the Sun. The numbers in this column, compared with those in the Maximum Shade column, are interesting as shewing the heating power of the Sun's rays, and consequently the clearness of the atmosphere, at different places; yet are they somewhat liable to be misinterpreted; indeed, very little weight can be attached to any single observation without knowing the state of the sky throughout the day on which it was made.

If at one place the sky was much more clear of clouds than at another about the time of Maximum Temperature, the Sun Thermometer at that place might rise 15 degrees higher than the Maximum Shade, whilst at the other place the difference might not exceed 6 or 7 degrees; in such a case a mere comparison of the differences would of course give a very incorrect idea of the clearness of the air at the two places.

This difficulty, however, occurs in a much less degree in using the difference of the monthly means of the Sun and Shade Thermometers. Thus the mean difference for March last is 10·8 for Armidale, 8·9 for Parramatta; the mean quantities of cloud at 3 p.m., as estimated by the different observers, and therefore, perhaps not strictly comparable, are ·55 at Armidale and ·52 at Parramatta, and so may be considered nearly equal; so that the heating power of the Sun was considerably greater at the former than at the latter place. This result is quite consistent with others given in the returns, for first the density of the air at Armidale is considerably less than at Parramatta, being in the ratio, as indicated by the mean Barometric results, of 268 to 300; and secondly the amount of moisture in the air, which has considerable influence in absorbing the solar heat, is also very different, being represented by 448 for Armidale and 591 for Parramatta.

In February the difference was still greater, the excess of Sun over Shade being 10·6 for Armidale and 7·4 for Parramatta; but then the disproportion in the mean cloud at 3 p.m. was much greater than in March, the numbers being ·37 for Armidale ·54 for Parramatta.

I have called attention to the consistent character of these results not as anything new or remarkable, but as a simple instance of the never-failing connection between cause and effect which continually presents itself in physical investigations, and of which many other instances might be deduced from the Tables now before us.

The indications of the Minimum Thermometer on the ground, or Terrestrial Radiation Thermometer, which occupy the next column, have hitherto been unsatisfactory; we have been very unfortunate with the Instruments; some have been broken, partly owing to their position, and partly from want of proper care; some fail to act as self-registering Instruments, as already explained. To this latter cause may perhaps be attributed the unexpected result of the Denilhquin observations for March, from which it appears that the mean reading of the Terrestrial Radiation Thermometer exceeded that of the minimum shade by 4 degrees, whereas in all other cases the difference was in the opposite direction. The next six columns under the head of "Moisture of the Air" give the elastic force of the vapour present in the air, which is very nearly proportional to its actual quantity; and its humidity, that is the ratio which that quantity bears to the quantity present in saturated air at the same temperature.

These quantities are obtained in the usual manner from the readings of the dry and wet bulb thermometers. Thus if e be the elastic force of the vapour in the air; f that of the vapour in saturated air at the wet bulb temperature; d the difference between the dry and wet bulb readings; h the corrected height of the barometer;

$$e = f - \frac{d}{88} \times \frac{h}{30}$$

The quantity e thus determined is that which appears under the head of "Force of Vapour."

Again if F be the elastic force of the vapour in saturated air at the dry bulb temperature; then the per centage which e is of F, or $\frac{e \times 100}{F}$, is the quantity registered under the head of humidity.

The values of f and F are taken from the tables of elastic force of vapour, determined from Regnault's experiments, being the same as used at the Greenwich Observatory.

In order to facilitate the computation of e, I have calculated a table giving the values of

$$\frac{d}{88} \times \frac{h}{30}$$

from 0 to 30 and from 25·8 to 30·4, taking into account every whole degree in the values of d and every fifth of an-inch in the values of h; by the use of this table much time is saved and the risk of error considerably diminished. I must here state that I cannot yet place such perfect confidence as I could wish in some of the Hygrometrical results, for the following reason.

As a general rule there is no very marked difference between the quantities of vapour in the air at 9 a.m. and 3 p.m., except when occasioned by a change of wind or a shower of rain; yet on examining the dry and wet bulb returns I find occasionally that on a dry day, with a W. or N.W. wind throughout, there appears to have been a very remarkable increase of vapour from 9 a.m. to 3 p.m., and an equally remarkable decrease at 9 p.m. This can only be accounted for by supposing that the supply of water by capillary action to the wet bulb, was not sufficient to compensate the rapid evaporation; so that the muslin on the bulb was partially dry at the 3 p.m. observation. The only course to be pursued in such a case is to reject, the wet bulb return altogether, and such rejection occurring only in the 3 p.m. observations, and sometimes three or four times in a month, may produce a very perceptible effect on the mean result.

This difficulty, however, will be of very rare occurrence as the observers become more experienced, and more convinced of the necessity for attending to every requisite precaution. It may be well to mention that no comparison can safely be instituted between any of our Hygrometrical results, and those formerly obtained from observations at the South Head; as the observer at that station was not provided with a Hygrometer, although he attempted as I am informed, to supply the place of a wet bulb thermometer by throwing water over one of the ordinary thermometers at the time of observations.

The hot winds by which we are sometimes

visited form an interesting subject for Hygrometric discussion.

It is frequently stated that those winds contain in reality a very great amount of moisture, although from our own sensations they convey the idea of excessive dryness. Such undoubtedly is the case; as an illustration of this I may instance the Parramatta return for January 5th, at 3 p.m. The dry dulb thermometer was then at 101; the wet bulb at 79; the pressure of vapour was ·754 indicating the presence of as much vapour as would saturate air at a temperature of 70·8, and considerably greater than the average pressure for the month which was ·674; at the same time we find that the humidity was only 38 whereas the mean humidity for the month was 73.

This paradoxical result is of course accounted for by the fact that, the capacity of air for vapour increases much more rapidly than the temperature; the quantity of vapour required to saturate air at 100, being twice as great as at a temperature of 78 degrees. Thus the air may contain much more than the average quantity of vapour, and at the same time owing to its greatly increased temperature and capacity for vapour, may produce rapid evaporation from the skin or from any other moist surface, and may thus appear excessively dry.

In accordance with this is the result which may be noticed in all the monthly abstracts, that whereas the mean amount of vapour is nearly the same at the three hours of observation, the humidity is much the greatest at 9 p.m., when the temperature is least, and the least at 3 p.m. when the temperature is greatest. The next subject of observation is the extent of cloud, the numbers representing the tenths of the sky supposed by the observer to be obscured at the time of observation. There is considerable difficulty in registering this quantity satisfactorily; clouds near the horizon appear to the eye to occupy a much larger space than they would seem to do if near the zenith, neither is it easy to lay down any rule for compensating this delusion. It is probable, however, that when we take the monthly means, observations made by the same person, and even those by different persons may be compared without any very great error.

Respecting the Rain Gauge results which occupy the last column in the table, I can only state my conviction, that the graduated glass measures of capacity, which are used at our Observatories, are far more accurate than any direct measurement of depth, however, carefully conducted.

In consequence of the expense of printing, I have not thought it expedient to publish a table, like that for Parramatta, for all the Observatories, but have contented myself with a Monthly Abstract, giving the mean of all the quantities in the complete returns.

The Tables are in manuscript, and may be inspected by any person who has a definite object for so doing. In conclusion, I must ask you to consider this paper, like the former one, as only introductory to such discussions of the results of our observations as I may be enabled from time to time to lay before the Society. At the same time, I trust I shall not be supposed to claim a monopoly of the subject, but that the field will be entered by many other members of the Society, who will find abundant matter for their investigations in the returns which are now published every month.

RESULT OF EXAMINATION AT THE MINT OF COAL, FORWARDED BY DR. O'BRIEN, FROM BELLAMBI.

October, 1858.

The sample sent for examination had not the appearance of a first class coal, being rather dull and dirty in its fracture. It was, however, taken from too near the surface for it to be a good criterion of what the seam might prove, when more fully opened.

The following table presents the principal points of interest in the coal.

Specific Gravity.	Moisture per cent.	Volatile matter other than moisture per cent.	Coke per cent.	Ash per cent.	Sulphur per cent.
1·315	1·00	26·2	72·8	6·55	·896

The coke obtained was of an inferior description.

CORRESPONDENCE.

HYDRODYNAMICAL PROPULSION.

"All Theories look dreamy till they have attained the material details requisite to advance them to the dignity of facts."—J. A. FROUD, Westminster Review, January, 1850.

To the Editor of the Sydney Magazine of Science and Art.

SIR,—Wishing to bring this subject under the notice of our Australian *savans*, especially of gentlemen of Mechanical genius, who amongst men of Science, are the most likely to take an interest in it, I solicit the favour of a place for a few remarks in the principal Scientific Periodical of this metropolis, as the most suitable medium of communication to the limited but intellectual circle whose attention I would respectfully invite.

It is a matter of notoriety, especially in Melbourne, that I have long asserted the discovery of a "New Motive Power," originated in Victoria, or new "Propulsive Agent," alleged to be capable of being employed as a substitute for steam, to effect the locomotion of carriages on Railroads and common roads, and of vessels on the water, as well as for driving mills and machinery; and I have already publicly avowed in the *Sydney Herald*, of the 13th September and 8th of October last, that this propulsive agent, which so long as I deemed it necessary to keep the matter secret, I jocosely designated my "magic-powder"—is nothing more nor less than *fluid*, viz., for all ordinary purposes, *Water*; and for the propulsion of locomotive carriages, the most ponderous of fluids, *Mercury*. Further, it is no secret, that I came hither from Melbourne many months ago for the express purpose of testing my theory by practical experiments; and it being palpable that I have not as yet succeeded, it doubtless is, and very naturally, *inferred* by the public at large, that "I *have* failed" (which, as far as relates to one very injudiciously constructed machine, I admit)

and that "my theory is untenable, which *I deny*.

That logically and practically, the *onus probandi* rests with the assertor of a proposition, is of course indisputable; but that an allegation must be false, because unproven,—must be untenable, because the party making it happens not to be in a position to establish his affirmation by this proper and only valid evidence, viz., the test of expensive mechanical experiments,—no man of sense will assume any more than he will jump to the conclusion that a plaintiff or prosecutor has and can have no cause of action, because unable to produce his witnesses in Court. To the prejudiced, who choose to *think* me wrong, and are pleased vaguely to accuse me of hallucination, arguing (as certain cognoscenti have done in another colony, who will yet bite their lips on making the discovery that opposition, though extremely magnanimous, is not invariably a proof of wisdom, and that "pooh-pooh," though truly unanswerable, is not necessarily a convincing argument to the mind of a close reasoner) that as I have not yet done, what in fact I have not the means of doing or of properly attempting—*ergo*, it is *quite* certain, that I could not effect what I propose, if the requisite appliances were at my command! to *such* philosophers, I do *not* address myself; but to men of candour, of impartiality and of sound sense and judgment, and to such only.

It is undeniably mortifying to have it made public, that one's resources are inadequate to the demand on them, especially for a purpose of importance (although it is *some* consolation, to know, that *not a few* of the real *magnates of the World* have been unthrifty, and as much like the undersigned, with respect to circumstances, as he aspires to be like them, in honorable usefulness) still it is annoying to have it known, that one has not a thousand pounds at *command*. It becomes, however, a question for the decision of common sense, whether in order to conceal this circumstance and endure it, submitting to its fatal consequences in silence, one should forego not merely the prospect of personal advantages incalculable, but also the *happiness* —not to mention the honor—*of being useful to Society*; or, by candidly disclosing the real state of the case, seek its remedy, and take the chance at least, of acquiring honorably from one's fellowmen—neither as superiors nor inferiors, but as *fellow subjects and fellow-Colonists* the support requisite to effect the object, which when achieved, all will unite in extolling, and will have no slight reason to rejoice in. It will be seen that my election is made; and finding it undeniable if it were possible to conceal the fact, that "I am *not* a millionaire," I now candidly state that I have already—directly and indirectly—expended a much larger amount than I contemplated or could well afford, in experimenting on my theory, &c., as yet without success, and I will briefly explain my reasons for desiring to pursue the subject—as a first or preliminary ground, assuring you Sir, that my conviction instead of being destroyed or materially shaken, by long and careful investigation, and by consultation with men of the greatest ability in this colony as well as in Victoria, is but confirmed, especially by pertinent facts which have come to my knowledge quite recently—one to which I more especially allude, for which I am personally indebted to your politeness, this very day, since this writing was commenced. Let me not however be misunderstood. I do not say that the high scientific authorities with whom I have had the honor and advantage of consulting, entirely support my opinion in each of the several propositions comprised in, or connected with my propulsive theory, based on Hydrodynamics; especially in that one, which I deem by far the most important of all, "the conversion of *Hydraulic pressure into propulsion automatically*;" but this, I do say—that Dr. Scoresby's favourable sentiments are not gainsaid by any, but are more or less supported by all the men of science whom I have been privileged to consult. Surely this is one point in my favor, (although I deem it inferior to some others;) *i.e.* in *support of the expectation* that my theory will yet prove sound and practicable, at least in part. This applies to Navigation only, and is designated by letter B in my rationale or synopsis.

With relation to the several other branches of my subject, it is of course impossible to enter into details respecting a matter which is intended to be made the subject of a Patent; but I do not see any sufficient grounds for believing that the object of my ambition, and of my long-cherished hopes, the *desideratum* aimed at —"automatic propulsion"—is a physical impossibility, although it has much of that appearance at present: on the contrary, I still predict, that if such success be too great for me, it will yet be achieved, sooner or later, by some person more fortunate than myself, who will realize my intention and suggestion with no slight *eclat*, but not improbably creating him a millionaire. But should I succeed in effecting the propulsion of a railway carriage, though at first unable to render the machine self-acting, even if manual labour be indispensable to work the engine, is it a matter of *insignificance* to introduce a new means of propulsion and locomotion by which that safe and inexpensive agent—*cold water*, may be employed in lieu of, and as an efficient substitute for those dangerous agents at present in use—*fire* and *steam*, with the cumbrous and expensive appurtenance—*fuel?* I am perfectly aware that it would be affectation on my part to doubt, that the illustrious individual, be he whom he may, who may be distinguished in the annals of Australia for having made some important discovery in the preparation of snuff, or in the science of dressing dolls, may *rely* on the attainment of both fame and fortune, and may confidently depend on receiving the most liberal patronage in these colonies, especially if he should devote his great talents to the exquisite art and science of distillation; whilst the design and effort to establish a new means of locomotion, merely divested of danger and expense, is noticed only to be sneered at and opposed, as quite unworthy of the attention of the philosophers who patronize the sciences and useful art, or of the encouragement of the enterprising merchants and capitalists of Australia.

That individuals are to be met with—and very little south of the latitude of Sydney, so

despicably narrow minded, as to predict the failure of any theory—not from even the slightest knowledge of the subject, but as though it would be painful to them to witness success attend any efforts but their own, I am but too well able to avouch: yet will I not permit myself to believe, that such paltry and unmanly feelings can be general in society; but I rather hope, that like insanity, meanness, and jealousy, which would repudiate and try to defeat the efforts of an ardent votary of science, in the pursuit of a great public good, must be the miserable (but alas, not in frequent) exception only.

My reasons for thinking that it will be *unsafe* for the reader to bet *very* great odds, that my propulsive theory will not ultimately be established, and converted into successful practice; I will here state, however feebly, with sincerity, That I am radically or materially wrong, (except it *may* be, as to making the machine self-acting) is neither demonstrated nor seriously contended by my consultors. And with respect to that great point, which if achieved, it is admitted will render hydraulic propulsion one of the glories of the age; whilst I am incapable of the presumption of asserting it to be possible, in contradiction of the opinions of intellectual gentlemen of the highest attainments as mathematicians and men of science, whose authority I do not underrate, but whose courtesy and judgment I acknowledge with gratitude and respect; yet would it be unworthy of a man of honour, and as I hope, of understanding, sneakingly to pretend to be convinced, when in truth, I am *very far* from being convinced, that the error under which I am said to labour, is a *vital* error—an error in principle, and therefore irremediable. On the contrary, I yet dare to think, but without presuming to assert that the difficulty is not insuperable. Here it is, that without disparaging the opinions of men of science, who deem the present difficulty fatal, I ardently desire the advice and assistance in consultation, of a small conclave of civil and mechanical engineers, reposing great faith in the dictum of Solomon (though in a *limited sense*), that "in the multitude of counsellors, there is wisdom;" believing that I am not singular in thinking, that the word "multitude" should be taken to imply about the number of an English jury; for, whilst in such considerable yet limited number of "honest men and true," chosen from amongst the class most competent to deal with any matter under consideration (as the twelve Judges of England constitute the final Court of Appeal, from any of the Courts of Civil or Criminal Judicature in the Empire) the best and most nearly perfect results may be expected; all experience testifies, that in a "*multitude* of Counsellors" (in the popular acceptation of the term—a *very* large number,—as *many* hundreds—by Johnson defined "a throng")—there is apt to be much less manifestation of "wisdom," than of *confusion*, resulting from the concentration and contact of the passions, feelings, and infirmities, of imperfect human creatures, bought into *collision*, by the ignorance, misapprehension, prejudices and partialities, and conflicting interests, of which large assemblies of men cannot be divested, so long as human nature remains in that fallible state which it *seems* to be in, at present. Whether it proceed from obtuseness of intellect, or from the prejudice in favour of a long cherished opinion, or peradventure (may it not be so?) from the innate truth of certain deductions gleaming on my mind vividly, but intangibly, like the lightning's flash, or the flame of a candle, which when blown out, it is alike impossible for the beholder to doubt or to solidify—my understanding is not by any means convinced of the error imputed to me in consequence of success not having as yet attended my efforts to effect propulsion, which efforts have been nullified or paralysed, by want of sufficient means—whatever the cause; certain it is, that—with the utmost deference to the magnates of science alluded to, in comparison with whom I am a tyro, a mere pigmy,—I cannot help retaining the impression, that automatic hydraulic propulsion may yet turn out to be no physical impossibility; and if it be possible, that it will assuredly be accomplished sooner or later, to the benefit of the world, and to the undying fame of the happy mortal who may be privileged to realize my purpose, and to carry into effect my designs.

It may be proper to say a few words in vindication of my temerity in daring to maintain an opinion, in opposition to high scientific authorities; and although as one of the oldest colonists and government officers in Australia, I have the honour to be sufficiently well known to some of the principal residents in most of the colonies, including the highest officers in more than one of them; yet after an absence of nineteen years from Sydney, being now a comparative stranger in New South Wales, I could wish it to be understood, that it was on *no light grounds* I first arrived at the opinions which I have, however imperfectly, wrought into a theory which has been honored with such consideration, as I may be permitted to believe it would not have received if it were *utterly* worthless. Of course I allude principally—but very far from exclusively—to the sentiments expressed in relation to this subject, by the late eminent Dr. Scoresby,* who thought so favorably of it, as to have kindly undertaken to present my paper personally to the Royal Society of England, of which he was so distinguished a Fellow; and pending the doubts, which seem to be *interminable*—whether my propulsive theory be sound or unsound—practicable or impracticable, I would adventure the remark as most pertinent, that he has been established in so many instances against the repudiators of inventions, and the denouncers of mass of genius as "visionary," by the triumphant success and worldwide fame of the repulsed discoverers and inventors, that a man of sense will be somewhat slow to assert authoritatively, that an untested theory must be fallacious, because being novel it is necessarily strange and perhaps startling, on its first announment. Was not

* "Of the positive sources of power on which your "plan depends for efficacy, there is one which I clearly "apprehend, and have indeed often spoken of or con-"templated, but never published or carried out."

Extract from letter to Mr. Kentish, from Dr. Scoresby, dated Toorak, May 15, 1856.

Fulton the American, and before him Symington the Englishman, and Miller the Scotchman, "pooh poohed" and thwarted in the introduction of steam propulsion? Nay, did not so great a man as Dr. Lardner, even after the establishment of steam boats on the Clyde and on the Thames, pronounce it to be an absurdity to attempt, and an *utter impossibility* to effect the navigation of the Atlantic, by steam; and by ridiculing the idea, did not that philosopher, in that instance, make himself ridiculous? Had not *Columbus* to encounter incredulity and opposition from monarchs and ministers, as well as subsequently when at length enabled to proceed on his voyage of discovery, from his own ship's company and crew, before he was privileged to effect the greatest and most important physical discovery ever made by civilized man? "True," says the handsome but sceptical reader —"true; but what is this to the purpose? you Mr. Writer, may for aught I know, be as black as a nigger, as stupid as a calf, and as *obstinate* as a mule." Well, bowing to the politeness and succumbing to the logic of "my gentle Public" in general, and of our good looking reader, who must be *educated* Mr. Editor, or he could not read—and *thinking*—or he could not reason—I will, with permission, and at the risk even of being charged with egotism, endeavour to "show cause" *why* I should not be condemned unheard—*why* my Theory should not be denounced without a fair and full trial—and *why* my *tenacity* to my unestablished (*but unrefuted*) Theory, should *not* be deemed *pertinacity*.

On two occasions in my life, I have been *immoveable* in my opinion, and persevering, despite the denunciations and vehement opposition of the weightiest authorities and most powerful influences that it was possible to have to contend with; which unchangeableness, was of course in the one case, as now in the other, charged on me as "obstinacy." Be it so—I accept Dr. Johnson's definition of "resolute persistency;" to this I plead guilty; but to "stubbornness" I demur. In this remark, it will be apparent that I allude chiefly to a past transaction, of which I am about to give you a brief narrative; on which occasion I had virulent personal and official opposition to contend with; instead of science piqued, and apathy confirmed, as in the present instance.

The former occasion of my evincing intense obstinacy—arising no doubt from phrenological development, in which the bump of firmness or consistency is *prodigious*—was as follows:— As a Government Surveyor in Van Dieman's Land in 1842, being selected by his Excellency Sir John Franklin, and by the Chief Agent of the V. D. L. Company, to undertake a duty of importance and of great difficulty, viz.: the exploration of the densely wooded and mountainous interior, between Launceston and the Company's territory known as the Western Country, with instructions to lay out, if indeed it should prove possible, a travellable line of road through the same; which object had defeated all former attempts that had been continually making during the seventeen years then last past, by three or four sets of Surveyors who had all given up the task as hopeless—(our party nearly perishing) officially certifying to the object desiderated being a "physical impossibility." After about 15 months of bush-life, where (besides laying out the so-called Farm for the Company in 40 acre sections.) I had opened a road satisfactorily one-fourth of the distance between the termini; definitively marked out another fourth, and by careful investigation of the remaining half, quite satisfied myself of the practicability of the object of my expedition, and certified to the same, pledging my reputation to accomplish this purpose which had been so great a desideratum to the Government and especially to the millionaire Company, nearly 20 years; the directors in London sent out orders to their resident agent not to incur another shilling expense on the exploring and road-engineering business, as from the concurrent testimony of eighteen annual reports, they were quite satisfied it would prove only another fruitless attempt. The Government, which had agreed to bear a moiety only of the expense of the exploration and survey, of course thereupon likewise declined further proceedings; and to console me for being deprived of the power of accomplishing my arduous undertaking and of establishing my reputation and acquiring some *eclat* in so doing, I was politely assured by my two official superiors, the one in Hobart Town, who had never been within 130 miles of the eastern side of my work; the other at Circular Head, who had not ventured nearer than 20 or 30 miles of the west of it: that *they knew* the object of my engagement, viz., to discover and lay out any better or other line of road than the old route, through that extraordinary region of jungle, mountains, and ravines, intersected by five large rivers, to be physically impossible; and accordingly, without the slightest imputation of reproach, I was to relinquish any further proceedings as useless. In this instance, and under these circumstances, supported by the organ of *firmness*, I could no longer help demurring, than I can now help it, to a dogma which I *knew* to be untenable. I was vehemently accused of "contumacious *obstinacy*" by these two gentlemen, who were strengthened in their open hostility by a host of powerful officials allied against me, with all of whom I had to do battle single-handed. An excellent and respected Governor, Sir John Franklin, was at this juncture succeeded by one, if possible, more excellent, Sir Eardley Wilmot, to whom I appealed; and surrounded as he was by my opponents, his Excellency's discernment, impartiality, and love of justice, would not permit a stranger who had nothing to rest his claims on but merit, but who challenged and respectfully demanded investigation, to be condemned untried. The senior officer of the department was accordingly despatched to the wild bush—the scene of my discredited labors, with instructions to examine my work, which had been condemned unseen, by gentlemen who each pronounced the other a high authority, to survey my marked line of road, and to report on it, and on my allegations, made from practical knowledge and hard work, which were vehemently denounced as misrepresentations by the two gentlemen whose authority rested solely on

clairvoyance. It so happened—of course by mere *chance*—that every allegation I had made, was, somehow or other, confirmed by the geometrical results arrived at by the use of the chain and theodolite employed to detect my misrepresentations; which mathematical demonstration, Sir Eardley decided as being more reliable evidence, than conjecture however shrewd, and reasoning, however candid and logical, on the part of philosophers a hundred miles distant from the *locus in quo*. The issue of this *adherence to my convictions* on the occasion mentioned, denounced by my superiors as "obstinacy," was, that I had the honour and gratification to receive the commands of the noble Viceroy, to resume and complete my work, in which I had been interrupted the four summer months; having—on being questioned by his Excellency—intimated my hope and expectation, to save at least twenty miles of distance by my new road, and altitudes and gradients in a still greater proportion. And *what* was the result? such, as there can be *no false pride* in mentioning, being a physical success, perhaps, unsurpassed by that of any Surveyor or Engineer in these colonies or in any country on the globe; and which if I were a younger man and had not relinquished my glorious but laborious profession, I should not have permitted to remain almost unknown;—I saved *two-fifths* of *the distance*, viz: not twenty only, but forty miles, out of 101½; at the same time effecting a saving both on the average and in the aggregate, of *three-fourths* of *the altitudes*; in all, 7324 feet, out of 10,069! This triumphant success, as unexpected as unprecedented, secured to me the regard of my revered friend and Patron, and acquired the honor of official thanks from his government; yet at the same time—sad to say—brought down on my devoted head, the bitter enmity of the functionaries, to whose theoretical, I had dared to oppose my practical knowledge of one of the wildest and most difficult countries penetrated and opened up by mortal man, and in each of whom, the organ of magnanimity was so little developed at that period, that instead of rejoicing at my achievement of the object of my instructions, and of their ardently expressed wishes; it was imputed to me as a high crime and misdemeanor, to presume to affirm that I could effect the arduous object I had undertaken, when they were pleased to pronounce it an impossibility. The performance of which, in confirmation of my allegation and confutation of theirs, was deemed an aggravation of crime so heinous, as to be still unpardoned by those amiable and much injured Vandemonians.

It was my consolation on this occasion, in 1845, to be honoured with the warm commendation of poor Sir Eardley Wilmot for my "*indomitable resolution* and zeal," as well as ability, "in a right cause," ascribed to me by his Excellency.

Now, Sir, I ask of you and of your readers, if I should prove but half as successful in my propulsive theory, when fairly tested, as I have indisputably proved, with respect to my bitterly opposed allegation of the practicability of a shorter and better route through the western country, than the Company's so-called "road" over Gad's Hill, of altitude, 2700 feet, and gradients very much like a staircase—where is the man that will condemn as "obstinacy," the *perseverance* in a well founded conviction, of

Sir,
Your humble and obedient servant,
N. L. KENTISH.

P.S.—Referring to the April number of this Magazine, page 235, it is impossible for the man of science, the mechanic, or the philosopher, and it would be difficult for the intelligent man of the world, to read and reflect on Mr. Peppercorne's able "Essay on Motive Power," especially the clauses from 8 to 13 inclusive, without being struck with the applicability of the principles and sentiments enunciated, to the subject of this communication, in—as I hope and believe—the very spirit of prophecy.

The power of gravitation, or the force of gravity, and the adaptability of fluid to exert the quality of ponderousness hydraulically, no one can doubt who only bears in mind, that the most stupendous work of Art on land—the great tubular bridge across the Menai Straits was elevated to its enormous height of 180 feet, and placed in position, by Stephenson, by means of the hydraulic press; and that the greatest work of Art afloat, the Leviathan, was at last launched by Brunel, by the hydraulic ram.

What says Mr. Peppercorne? "Visionary as it may seem to some persons, the writer is convinced that the steam-engine will dwindle into insignificance before the close of the present century. Providence has furnished us with a power unlimited in quantity, and capable of performing more work than all the steam-engines or other engines in the world. It is for man to render available this boundless power, as it was doubtless intended that it should be employed, by the bounty and benevolence of the Great Creator and Architect of the Universe.

"This power is the force of gravity, and it seems almost superfluous to enumerate the many advantages which it possesses over steam. There is perfect safety from all danger of fire or explosion. There is no expenditure of materials when the engine is not in action, and its power can be applied at a moment's notice, as it is always ready for action, without previous consumption of fuel in getting up steam; and in sea-going vessels, there would be no freightage occupied by coal. These are the most important advantages which it offers; but many others will suggest themselves to any one who reflects on the peculiar nature of the two forces. Many scientific men are of the opinion that the force of gravity is inapplicable as a motive force; and they base their disbelief, on the failure of the attempts that have hitherto been made to utilize it. This is unfortunately true, but *it does not necessarily follow, that every attempt* to bring this great power into practical use, *must prove delusive* or end in disappointment.

"A discovery which, *after it is known*, seems so simple that everybody wonders that *he* did not see it; may remain hidden for thousands of years, but at last prove of sufficient importance to immortalize the name of its discoverer."

I may not ask who is the man so bold as to

Registrar General's Office,
Sydney, 11th November, 1858.

HEALTH OF SYDNEY.

The number of Deaths registered at the Central Office during the month of October was 135, viz.—81 males and 54 females. This is considerably in excess of the Mortality of either of the three preceding months, and approaches towards the average of the summer quarters. Deaths from Zymotic Diseases have been greatly in excess of the usual rate; and there is still far too large a proportion of deaths observable amongst children under 5 years of age. Scarlatina has been fatal in no less than 20 instances.

The number of Deaths registered in the corresponding month of last year was 111*; and in 1856 was 103.

The number of Births registered during the month was 169, viz. :—81 males and 88 females, being 34 in excess of the Deaths.

* Nine of these having occurred in previous months, were omitted from monthly publication.

TABLE SHEWING THE DEATHS OF MALES AND FEMALES REGISTERED IN EACH WARD, FROM 1ST TO 31ST OCTOBER, 1858, DISTINGUISHING THOSE UNDER 5 YEARS.

WARD.	Under 5 Years.			Above 5 Years.			Grand Total.
	Males.	Females.	Total.	Males.	Females.	Total.	
1.—Gipps	5	4	9	4	6	10	19
2.—Bourke*	6	2	8	12	5	17	25
3.—Brisbane	5	1	6	6	4	10	16
4.—Macquarie	2	1	3	1	...	1	4
5.—Cook	5	4	9	7	6	13	22
6.—Fitz Roy	5	10	15	4	1	5	20
7.—Phillip†	4	2	6	8	3	11	17
8.—Denison	5	2	7	2	3	5	12
Total	37	26	63	44	28	72	135

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1ST TO 31ST OCTOBER, 1858.

CAUSES OF DEATH.	Under 1 year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages.
ZYMOTIC DISEASES. Endemic, Epidemic, and Contagious	2	2	7	6	7	24	6	1	...	1	2	1	...	2	...	1	...	...	1	...	...	...	...	...	...	...	38
SPORADIC DISEASES. *Of Uncertain Seat.*—Dropsy and other Diseases of variable Seat.	12	...	...	...	1	13	...	...	...	1	...	1	...	...	2	1	...	1	...	...	...	...	...	...	...	...	19
Of Nervous System.—Diseases of the Brain, &c.	9	1	2	...	1	13	...	...	...	1	...	...	2	...	1	...	3	...	1	1	...	...	...	...	...	...	22
Of Respiratory System.—Diseases of the Lungs, &c.	2	2	...	1	...	5	...	...	...	6	...	2	2	2	...	1	...	...	1	...	...	...	...	...	...	...	20
Of Circulatory System.—Disease of the Heart and Blood-vessels	...	...	...	...	...	...	...	...	...	...	...	1	...	2	1	...	...	...	...	...	...	...	...	...	...	...	4
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	...	1	...	...	1	2	...	...	...	1	...	1	...	1	...	1	1	...	...	...	...	...	...	...	...	...	7
Of Urinary Organs.—Diseases of the Kidneys, &c.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Generative Organs.—Childbirth, Diseases of the Uterus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Of Integumentary System.—Diseases of the Skin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Old Age	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	3	1	...	1	1	1	...	...	...	7
External Causes.—Violence, Privation, and Intemperance	1	...	...	1	...	2	...	...	...	1	...	2	...	...	3	...	...	...	...	...	...	...	...	...	...	...	8
Unspecified	3	...	1	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	9
Total from all Causes	29	6	10	8	10	63	7	1	...	11	2	8	4	7	7	5	5	1	5	2	...	1	...	1	...	5	135

CHRIS. ROLLESTON, Registrar-General.

QUARTZ CRUSHING.

In previous numbers we have directed attention to the great results that are likely to be developed by the increasing employment of quartz crushing machines on the auriferous reefs of this colony. We are glad to hear that large quantities of machinery, to be worked both by steam and by water power are now being prepared, and will soon be sent into the interior to set at rest the question as to the paying character of this speculation.

In the meantime, the discovery of new reefs of quartz in many cases proved to be highly auriferous is recorded in the daily paper, and the intelligent gold miner who is commissioned by the "*Sydney Morning Herald*" to examine the Goldfields of the Western District, has published an interesting account of his explorations of the mountain ranges, which feed the River Turon and its tributaries. Here he seems to have found a vast network of quartz veins, from which, by the disentegrating action of time and storms, the rich gold deposits were carried down and deposited in the beds of those Pactolean streams.

The time is rapidly approaching when the alluvial deposits in all our known gold streams will be exhausted, it is highly necessary therefore for us to ascend to the sources from whence that wealth was derived, and to try if human ingenuity with all the aids of modern science cannot force these, harder than iron bound treasure houses, to yield up their stores of wealth.

There is one fact necessary to be borne in mind by the adventurers who may determine to engage in this enterprise, it is, that nothing but associated labour can be remunerative. We do now and then hear of an isolated case, where a miner with a common hammer having discovered a particularly rich deposit in quartz, finds it to be worth his while to triturate the matrix and then to extract the gold in the common way, but these are very exceptional cases indeed, and this mode of operation must leave a very large proportion of the precious metal unextracted. It is highly important therefore that some cheap and compact machine should be discovered, which would enable small companies of men to engage in the work of quartz crushing on their own account.

His Excellency the Governor-General with his usual thoughtfulness and energy, introduced to the Philosophical Society, at its meeting on Wednesday, December 8th, a machine, which appears admirably adapted for the purposes we have indicated. It is a Patent Quartz Mill, invented by Messrs. King and Howland, who appear to be themselves practical gold miners. It is a great recommendation to this machine, moreover that it is manufactured in the colony. Messrs. P. N. Russell and Co., of Sussex-street, are we believe the manufacturers, and they have exhibited this machine in action to several practical men in this city, whose opinion of its adaptation to the work required of it is proved by numerous orders.

As it appears to us that quartz crushing will most probably be the most productive industry of the colony for years to come, and as we have not any knowledge of a better machine for the use of the working miner without the expenditure of a large capital, we have prepared an illustration and give the entire description of its working, furnished by the inventors and patentees.

We shall be much obliged if any parties of miners who may possess one of these Crushers, would forward to the Editor of this Magazine, details as to the cost of its working, and the amount of power required—whether steam or water power.

KING AND HOWLAND'S PATENT QUARTZ MILL.

The introduction of our Mills in the colonies of Australia is done with the utmost confidence, knowing it to be the most efficient machine (taking into account the amount it will do) ever yet invented, for reducing quartz to a fine pulp or powder, which is very important in order to extract the gold: as practical quartz miners (having been engaged in the business, in California for the last 9 years) we know our Mill will do more work and better, run longer and keep in better repair, at less expense than any Mill ever erected heretofore.

In California it supersedes all others.

You will see by the cut that it is a very neat compact machine, occupying but a small space, and may be thus described.

The bed plate is 3½ inches thick and 7 feet in diameter, the mortar 5 feet in diameter, 8 inches in depth, and is of an annular or circular form, having on the upper edge a drip flange 7 inches wide. Recesses ½ an inch in depth are sunk in the bed plate for receiving dies on which the stampers drop, thus saving wear of the plate. The dies (when worn so as to allow the stampers to touch the bed) are easily removed and new ones inserted. They are made of hard cast iron 3 inches thick, and, with constant use, will last a long time.

The frame consists of 6 iron posts or pillars cast hollow, through which a wrought iron bar or bolt is put extending from below the flange of mortar and through the top plate of the Mill. These bolts are fastened under the mortar flange with a key bolt, and at the upper end with screw and nuts, thus bringing the entire Mill firmly together.

2 feet 10 inches from lower end of pillars lugs are cast in the innerside on which rests a feeding plate securely fastened by bolts and screws; 1 feet 8 inches above this is another plate fastened in like manner, and 2 feet 10 inches higher is the top of the pillar on which the top plate rests, and fastened down as before described by the rod through the post; there are holes through each plate in which are brass boxes for the stems to pass up and down.

On the inside and centre of the stampers is regulated.

This tappet cannot unscrew of itself being secured by a set bolt or small screw.

mortar and cast with it, is a centre piece or column, extending a little above the feed plate on which centre or column a cast iron step is fitted, centered with a steel die on which rests and revolves the upright shaft (pointed with steel) on which the cam-wheel is placed.

The stamper heads are made in two pieces; the lower end or shoe is cast of white iron and so arranged as to be easily removed when worn out and replaced by new ones, and as they never drop in the same position, the face of the stamper shoe wears perfectly square and level. The weight of the stampers is about 525lb each.

The stems of the stampers are made of 2¾ inch round wrought iron turned smooth and straight. 2 feet 6 inches from the top a screw is cut on which the tappet or lifter is screwed by which, as the shoes and dies wear away, the rise and fall of

The stampers are lifted by a cam wheel fixed on the centre shaft, the wheel having 3 drops or off sets beviled so as to fit the tappet on the stem and likewise give it a rotary motion. The cams are faced with a bar of iron laid with steel.

The cam wheel shaft extends a little above the top of the Mill and has fitted a three feet bevil wheel made to work in a 10 inch pinion, the latter being fixed on a horizontal shaft having a pully by which the whole is set in motion and worked by eight horse power, either steam or water. Above the rim of the mortar and between the posts are six openings of 2 feet by 10 inches which are covered by a screw having 124 holes to the square inch through which the pulp or crushed quartz must pass. Above the screw the whole Mill is enclosed with boiler plate fixed between the pillars and secured thereto by bolts and nuts.

Inside, around the centre piece or column, is a curb or drum bolted to the flange under the feed plate; this curb extends down to within 18 inches of the dies in the bed plate and is 9 inches from the centre column, between which the quartz falls when fed in the Mill and drops the base of the centre piece, by which it is thrown directly under the stampers.

On top the feed plate is a bonnet or covering of an oval form extending to the top of centre piece three openings are made through which to feed the Mill; this covering is fastened to the feet plate, with bolts, &c.

Thus, when the Mill is put together it is a very neat, compact and durable piece of quartz machinery, every precaution having been taken to guard against wear and tear.

Minor King, of Melbourne.
William H. Howland, of San Francisco.

N.B.—For further particulars enquire of Messrs. P. N. Russell and Co., Sydney, N. S. W.

PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

December 8th.—Twenty-third Monthly Meeting of the Philosophical Society of New South Wales, held in the Sydney Exchange. His Excellency Sir W. T. Denison, K.C.B., in the Chair.

Lieutenant-Colonel Percival, was duly elected an ordinary member.

Two new candidates were proposed and seconded.

The following gentlemen were elected auditors in accordance with the Society's 12th Bye-Law, viz:—Andrew Bonar, Esq., the Honorable G. K. Holden, Esq.

A paper on "the Progress of Photography and its application to the Arts and Sciences" was then read, by Mr. James Freeman, for which he received a vote of thanks.

The President laid upon the table a paper "on King and Howland's Patent Quartz Mill," illustrated by a drawing.

A great variety of Photographic Views from different parts of the world, together with a considerable number of Photographic Portraits were laid out for the inspection of members and visitors. The following being the contributors and contributions, viz.:—

The Honorable Sir Daniel Cooper—three Portraits of celebrated Englishmen, three Photographic copies of Engravings.

The Honorable E. Deas Thomson, Esq., C.B.—Fifty-seven large Photographs of Buildings, Statues, &c., chiefly in Rome.

The Honorable R. J. Want, Esq., M.L.C.—Forty Photographs, chiefly from Italy, comprising:—Views, Statues, and copies of Engravings.

Professor Woolley—Twelve large Photographs and twenty Stereographs, from Rome.

Professor Smith—Several Stereographs from negatives, taken on the patent dry Collodion Plates of Dr. Hill Norris, a Photograph of a doorway at the University.

R. Hunt, Esq.—Thirty-two Photographs comprising Views around Sydney, and copies of Engravings.

W. S. Jevons, Esq.—Eighteen Views in the neighbourhood of Sydney.

M. F. Moresby, Esq., R.N.—Forty Talbotype Views, chiefly in Palestine and Egypt, taken 15 years ago, by the Rev. G. Bridges; also, several Views taken by Mr. Moresby, at Aneiteuma, Erromanga, and other South Sea Islands, during the cruises of Her Majesty's Ship Iris.

F. Haes, Esq.—Twelve specimens of Photogalvanography; 200 Photographic views in England, France, the Crimea, and Australia; 107 Stereoscopic Views in Egypt, Malta, Ireland, and the Crystal Palace; a Photograph of the Crucifixion from a celebrated bronze.

Messrs. Freeman—A large collection of Portraits in different styles, and of Views in and around Sydney, together with some Foreign Portraits and Views.

Mr. Dalton—A collection of Crayotype and Collodiotype Portraits, and a Photographic copy of an Engraving.

Mr. W. Hetzer—Large Portrait of Dr. Bland, twenty-two Stereoscopic Views, in and around Sydney.

Messrs. Brush and McDonnell—About 200 assorted Stereographs, six Stereoscopes, and a box of Microscopic Photographs.

Messrs. Flavelle and Co.—A Stereoscopic Camera, twelve Stereographs, and a Stereoscope.

ON THE PLURALITY OF WORLDS.

Rev. W. Scott, M.A.

Much has been written on the subject of the Plurality of Worlds; so much indeed that it may well be asked, what occasion is there for writing more; The question has been exhausted, the arguments on both sides have been ably stated by men of great talent and high standing in the world of science, and it seems useless and perhaps presumptuous to add anything to the multitude of words that have already been devoted to the subject.

But it is because of that very multitude of words that the points at issue are obscured rather than cleared up. Some are kept back from the subject by the amount of reading requisite for its full consideration; others by the fear that their astronomical knowledge will hardly enable them to understand all the arguments employed in the discussion; others again finding such great names ranged on opposite sides feel it impossible to come to any conclusion on a question on which such authorities are unable to agree.

Moreover, the subject has, I think, been very unfairly treated. When a purely scientific question is discussed, we expect to find it treated with perfect impartiality; the object of a true Philosopher is not to establish some favourite idea of his own, but to arrive at the truth; and this object appeals to have been lost sight of by the two distinguished disputants, whose writings on the subject have gained the greatest notoriety; namely, the anonymous author of the Essay on the Plurality of Worlds, universally believed to be Dr. Whewell, Master of Trinity College, Cambridge, and Sir D. Brewster, who first reviewed the Essay in the "North British Review," and afterwards reproduced his views in a more extended form under the title of "More Worlds than One."

The author of the Essay devotes a vast amount of learning and ingenuity to the task of upsetting certain commonly received notions as to the existence of other inhabited worlds besides our own. Sir D. Brewster's work is not a discussion of the question, but an answer to the Essay, and shows so strong, I may say so bigoted, a bias to one side of the question, and abounds so in remarks insulting to the reasoning powers of his adversary, that it scarcely deserves to be admitted into the list of Philosophical works.

An Essay on the Unity of Worlds by Professor Powell, though written in a more worthy spirit is somewhat vague and inconclusive, and cannot be regarded as a complete discussion of the matter, the author being chiefly occupied in discussing and refuting some of the arguments of the others without giving a clear account of his own views.

Such being the case I have thought that a very condensed discussion of the points at issue might not be unacceptable even to those who have already read the works above-mentioned.

Now the different points to be discussed are these:—

I. Are the other planets of the Solar system occupied by living beings?

II. Are the Stars the centres of planetary systems, and if so are their planets inhabited by living beings?

III. Are the Sun and Stars so inhabited?

IV. Are there amongst the inhabitants (if any), of those bodies, reasonable beings equal or superior to man?

The arguments in favour of an affirmative answer to the first question are as follows:—

We know that the planets are bodies resembling the earth in their form, in their revolutions round the sun and round their own axes, and in being so physically constituted as to obey the law of gravitation, each attracting every other body with a force which varies in the inverse ratio of the square of its distance; that they receive light and heat from the sun, and by virtue of their rotatious and orbital revolutions experience, like the earth, the alternation of seasons and of day and night; there is reason to believe also that they are surrounded by a gaseous envelope analogous to our Atmosphere; several of them are attended by Satellites which revolve round and give them light by night, just as the moon does with us.

On the other hand there are considerable differences to be taken into account, but they are differences of degree only and not of kind. Thus Mercury and Venus being so much nearer to the sun than the earth is, receive a much greater amount of light and heat, whilst the more distant planets receive a much smaller amount than the earth.

The masses of the planets and their volumes having been determined it appears that their specific gravities are in some cases very different from that of our planet, and again the forces of attraction at their surfaces vary considerably, so that any body transported from the earth to one of the planets, would be found to have a very different weight from that which it now has.

One of the planets is surrounded by certain rings which there is reason to believe are composed of fluid, which in course of time will subside into and deluge the planet; this supposition, however, cannot be considered as an established astronomical fact, and must, therefore, be left out of the question.

Now the probability of the planets being inhabited, having been suggested by their points of resemblance to the earth, we have to consider how far their points of difference render such a supposition incredible.

Does the difference in the amount of light preclude the existence of living beings; there seems but little show of reason for thinking so. There are animals on the earth so constituted that they can see better with such light as Jupiter or Saturn receive than they can in the light of day; such are cats and all animals that seek their prey by night; and if there is so much difference in one direction between their eyes and ours, why should there not be an equal difference in the opposite direction? Why should there not be an order of animals whose visual organs are adapted to a much more intense light than are our own, thus rendering them fit inhabitants for Venus or Mercury? It appears to me then that the objection of the difference of light has no weight whatever, and must therefore be set aside entirely.

The difficulty of the difference of Solar heat is not quite so easily dismissed.

The figure of the Earth, being that of a fluid revolving round an axis; the nature of its different, strata some of which have every appearance of having been formed under the action of intense heat; point to the conclusion that the earth was at one period of its history in a state of fusion; whilst the character of some of its early organic remains and the observed fact of the increase of temperature as we go deeper into the earth's crust, are enough to convince us, that at all events it had at one time a much higher temperature than at present; but so far as we can ascertain no perceptible change is going on in the mean temperature of the earth's surface, and we can assert with confidence that no perceptible change has taken place in the mean temperature of the mass for many centuries; hence it follows that the earth has cooled down from a heated condition, until it arrived at such a state that the heat received from the Sun in the course of a year is exactly equal to that radiated from the earth into space in the same period. This is the condition at which every planetary body must arrive sooner or later, if it have not done so already; for if a planet be too hot—that is, if it radiate more heat in a year than it receives, then must it by that very process be in a cooling state, and must so continue until it arrives at the condition of equilibrium above described; if on the other hand it be too cold, then must it gradually grow warmer, from receiving more heat than it radiates, until it arrives at the same permanent state. This then, we have a right to assert, must be the normal condition of a habitable world; before it arrives at this its constitution is continually changing and we must expect the character of its inhabitants to be continually changing also, as in the geological periods of the Earth's history, but the permanent state must sooner or later arrive, and it is this state which concerns us most in the question which we are now discussing.

Let us take the case of one of the superior planets, Jupiter for example; the amount of heat derived from the Sun must be 25 times less than that which we receive; can life be maintained under such circumstances? Either the physical constitution of the planet itself, or of its atmosphere must differ from that of the Earth, so as to lose less heat by radiation and consequently to retain as high a temperature when in the permanent state as the earth does; or secondly, it may be in a transition state, cooling down from a much higher temperature; in which case the character of its supposed inhabitants must be continually changing, however slowly, and therefore it has not arrived at that permanent state which we are most interested in considering o

thirdly, the constitution of its inhabitants animal and vegetable, must be such that they require a much less degree of heat for the performance of their vital functions than we do.

The first of these three suppositions presents considerable difficulties to one arguing from analogy as we are doing. By supposing the planet surrounded by a vaporous atmosphere, such as to prevent or considerably diminish radiation of heat, we at the same time prevent the absorption of heat to the same degree; for whatever different modifications of matter we may imagine to exist in other worlds we cannot, without abandoning analogy entirely, suppose them to be governed by physical laws at variance with those with which we are acquainted; consequently we cannot admit the existence of an atmosphere which shall give free passage to the heat radiated from the Sun to Jupiter, yet retard the progress of that radiated from Jupiter into space. It seems therefore compulsory on us to admit that the permanent temperature of Jupiter, and still more, that of the more distant planets, must be much lower than that of the earth.

The second Hypothesis, that the planet may be undergoing a change, cooling down to its permanent state, is far from satisfactory to the advocates of a plurality of worlds; for it necessarily leads to this conclusion, that in process of time all the living creatures which now inhabit it must perish, and the Planet remain uninhabited throughout the eternity that is to follow.

We are driven therefore to the third Hypothesis that there may be living creatures differently constituted from ourselves, perhaps consuming more oxygen, and so possessing a more active source of internal heat, or in some other way adapted to endure a degree of cold under which few fluids with which we are acquainted could exist in any but a frozen state.

It might be difficult to explain or even to imagine the existence of such a race of beings, yet it would be still more difficult to maintain that such a race could not by any possibility exist. What has been said of Jupiter applies to the still more distant planets Saturn, Uranus, and Neptune, which receive respectively 100,400, and 1,600 times less light and heat than ourselves.

The case of Mars is not so very different from that of the earth; it receives about 2-5 as much light and heat, so that a point on Mars's equator receives twice as much heat as a point at the earth's pole; so that a much slighter modification is requisite in the constitution of Mars and of its inhabitants than in the more distant planets.

We must suppose analogous differences in the inferior planets Venus and Mercury, only such as to produce just the opposite effect. Venus receives twice as much, Mercury six times as much heat as the earth.

The consequence of this difference may perhaps be best understood by considering that whereas the Sun's heat produces frequently in this climate an increase of 50° in one day in the temperature of the air, in Mercury, under like conditions of atmosphere and constitution, it might produce an increase of 300°; so that whereas in Jupiter most terrestrial fluids would be reduced to ice, in Mercury they could only exist in the form of vapour. Here then again we must either assume some very great difference in the constitution of the planet or of its atmosphere, or we must imagine its inhabitants to be very differently constituted from ourselves; capable of living in an intensely heated vapour, with bodies in which vapours supply the place of blood and the other fluids in our bodies; in the midst of a vegetation wherein the like moist vapours supply the place of the water which nourishes and the sap which pervades that of the earth.

We have next to consider the varieties of density and of gravitation at the surfaces of the different planets.

The density of Jupiter is about equal to that of water, whereas the Earth's mean density is more than four times as great. Whether the density at Jupiter's surface is greater or less than its mean density we cannot determine; it may be that the tendency to increased density which might be expected from the enormously increased pressure as we approach the centre is counteracted by the increased heat, so that we may, without violating probability, assume the density of Jupiter's crust to be about equal to that of water. From this the author of the essay concludes that the planet must be composed of water; and with some reason, for to assume that the solid portion of a planet consists of rocks and earths of no greater density than water, is to assume either a difference in the elementary substances of which it is composed, or in the chemical affinities and laws of attraction by which they are held together; either of which hypotheses is opposed to the essence of an argument from analogy.

He then that shrinks from these suppositions must allow the planet to be composed of water, and to be peopled, if at all, by fishes, or marine animals of some description, whose characteristics it is unnecessary to inquire into.

The other difference, that of gravitation at the planet's surface, is much less important; a body on the surface of Jupiter presses towards his centre with a force about 2½ times as great as on the Earth's surface; so that an inhabitant of Jupiter must be 2½ times as strong in proportion to his mass as an inhabitant of the earth; or (a point which I think has not been considered by the disputants) if his density be analagous to that of the planet which he inhabits, namely one-fifth of that of terrestrial animals, then must his strength be half as great as theirs in proportion to his bulk. Such differences affect the argument very slightly; for we know that the relation between strength and bulk, and between strength and mass, on the earth, are very various; there are few of us probably who have not been struck with the great disproportion between the relative muscular powers of different animals,—thus the sustaining strength of the leg of an animal weighing 216 lbs. is six times as great, in proportion to its transverse section, as that of an animal weighing 1 lb.

Similar remarks apply, *mutatis mutandis*, to the differences in density and gravity in the other planets, and thus we may conclude our arguments so far as they apply to the planets and rest upon physical grounds alone.

All that we know of the moon, as bearing on the question, is that it has probably no seas, that it has very little atmosphere and that its days and nights are 28 times as long as our own; the consequence of the latter part being this, that the diurnal variations of temperature must be very great. Hence its inhabitants must, if they exist at all, be very differently constituted from those of the Earth. This, however, is of secondary importance, as the advocate of a plurality of worlds, would probably have no objection to regarding the Satellites as merely useful attendants on the primary planets.

II. The second principal question to be considered is this. Are the Stars the centres of planetary systems, and if so, are their planets inhabited?

To this question the reply is necessarily some-

what vague. The Stars like the Sun shine with a light of their own. From their enormous distance they may be as large as the Sun, and emit as much heat and light, though to us they appear as mere bright points.

From the ascertained periods of revolution of some of the double stars, that is pairs of stars revolving round one another under the influence of their mutual attractions, it has been concluded that their masses are not very greatly disproportioned to that of the Sun. If then we cannot prove them to be of the same nature as the Sun, we have sufficient grounds for assuming them to be so, until some reason can be shown to the contrary. As for the unresolved nebulæ, some of which, as the author of the essay argues, are probably real nebulæ and incapable of being resolved into separate stars, they, by the mutual attraction of their parts, must at some time be condensed into solid or fluid bodies, and so may be regarded as suns in a state of preparation, and therefore may properly be classed with the others in which that preparatory state has already been passed through. It may be that there is a vast variety in the magnitudes and masses of the stars, but variations in magnitude are unimportant to our arguments; for the microscope shews us how entirely independent the existence of animal life is of all considerations of magnitude. But if the stars are suns, are they also centres of planetary systems? It is probable that they are, but that is all. The extent of this probability may be thus illustrated: if we had never been informed of the fact that any of the planets besides our own was accompanied by a satellite, the question might well be asked, are they or are they not so accompanied? from their general resemblance to the earth it seems probable that they are, but that is all. On examining, however, with the telescope we find that some are and some are not, or at least we cannot yet discover that they are so; just so it is probable enough that at some future time we shall discover that some of the stars are like the Sun, accompanied by planets, and some not. This may seem a very loose style of argument yet it is the only kind that can be brought to bear on the question.

But if the stars are centres of planetary systems, are such planets inhabited? To this we can only reply, that whatever conclusion is arrived at respecting the planets of the solar system, the same may with great probability be extended to the planets of the stellar system..

If it was the will of the Creator, or as some would prefer to call it, a law of nature, that there should be a multiplicity of inhabited worlds, there seems no possible reason for confining such multiplicity to our own particular system.

Let plurality be once established and the advocate of unity cannot object to our extending such plurality to an unlimited degree.

III. But thirdly, Are the Sun and Stars themselves inhabited?

According to a well received theory of Sir W. Herschell's, deduced from the existence and character of certain dark spots on the Sun's disc, the Sun's heat and light proceed not from the solid portion of that body, but from a certain luminous stratum by which it is surrounded, like luminous clouds floating in its atmosphere; it is also suggested that between this bright stratum and the body of the Sun intervenes another darker and to some degree opaque stratum of atmosphere or cloud, which may so arrest the external light and heat, as to render the sun habitable even by beings similarly constituted to ourselves. But what must be the nature of those solar beings? If they have material bodies, then we know that even supposing the sun's mass to be diffused throughout the whole of its apparent volume, which is contrary to the above theory, their weight must be 30 times as great as at the Earth's surface, and consequently they must require a muscular power 30 times as great in proportion to their mass. If the objection of increased weight has any force with reference to the inhabitants of Jupiter, that objection is six times as great with reference to those of the Sun. As for the inhabitants of the Stars we can say nothing for or against them, except this, that if the Sun is inhabited, we can see no reason why they should not be inhabited as well.

IV. But fourthly, if all or any of the Celestial bodies are inhabited by living beings, what is the nature of those beings? Are they possessed of animal life only, or have they a moral intellectual and spiritual nature, so as to be classed with man as his equal, or it may be, as his superior?

On this question no physical considerations that can be adduced have any bearing whatever; man's spiritual nature is so totally distinct from his animal nature, that we cannot reason from the one to the other; all that we can say on the subject is, that as far as our experience goes, and that is not far, the spiritual part of man requires a material animal structure for its dwelling; and here I must not be supposed to deny the existence of unembodied spirits, but merely to state that such beings, of which we can form no conception whatever, have nothing to do with our subject, which treats simply of physical bodies, the Stars and planets, as the abode of animal life.

If we can find sufficient reason to believe that those bodies are full of life, still have we nothing to inform us of the existence amongst their inhabitants of properties analogous to those which distinguish man from beast in our own planet; we are again reduced to this argument; it seems probable that such should exist; it is the arrangement which we should naturally look for; just as the discoverer of a new continent on finding it full of animal and vegetable life, would naturally look for a human race to fill up its complement of inhabitants. We may go still further, and that too without passing from the province of philosophy to that of revealed religion.

Physical science teaches us to believe that the order and arrangement and mutual connection observed in all around us, are manifestations either of one great first cause, one intelligent Creator, or of some great and comprehensive laws by which the material universe is governed. On the former supposition it may be argued that the arrangement of animal and spiritual life with which we are conversant, is that selected by the Creator as the best, whence we may reasonably conclude that the same arrangemeut would be adopted in other worlds of like character to our own. Those on the other hand, who substitute a law of nature for a Creator may expect from such a law, that similar worlds are similarly inhabited, with such modifications only as are due to their different circumstances.

In either case we are led to the conclusion, that if the celestial bodies are inhabited at all there is a strong probability of their being inhabited by beings analagous to ourselves.

Thus far I have confined myself most carefully within the limits of physical reasoning, to the total exclusion of all arguments drawn from, or supposed to be drawn from, revealed religion. Science and Religion are totally distinct from one another, and treat of subjects between which there is no connection. They have at times been

forced into collision, but never with any enduring result. Religion, or rather the mistaken views of individuals and churches regarding religion, may have checked for awhile the progress of science, as when the authorities of the Christian Church endeavoured to stifle the now universally received doctrine of the Earth's rotation ; but the progress of truth cannot long be delayed, it marches on with resistless force, until at last mankind are awakened to the fact, that the ends of science have been attained, without the slightest damage being done to its supposed antagonist.

It is high time that the world at large and the scientific world in particular should acknowledge this truth ; the believers in revelation should know that their scriptures contain and are intended to contain, a revelation of religion alone ; and that the book of nature is the only book which God has given to man in which to read the laws of his material creation. The most strenuous advocates of the full inspiration of the Christian scriptures, cannot lose anything by allowing that the writers of those books were ignorant of the truths which astronony and geology have since brought to light ; in fact they gain vastly by such an admission, for they thereby escape from a most difficult and dangerous dilemma in which they are placed, when they find their faith opposed to their reason, the words of their sacred writings in direct opposition to the evidence of their senses. Yet strange to say, men whom we are accustomed to place in the first class of philosophers of the present day, have made their religion or rather their own peculiar views on certain religious questions, the great basis of their arguments on a question purely physical. And why ? because one imagines that the existence of other inhabited worlds may shake the belief of religious persons in the superintending care of God ; as though religious persons of this age had so low an opinion of God as to fancy that He could be affected by considerations of number ; that it is more difficult for Him to take care of many worlds than of one. Another is anxious to establish the existence of habitable worlds because without them he cannot find a habitation for the souls of the departed ; he cannot see with his material eyes, the habitation of those beings which his own authorities tell him will have spiritual and not natural bodies.

From persons who are influenced by such lowering and unsatisfactory ideas, we cannot expect any very satisfactory treatment of the subject. And so one derives much comfort from recent microscopic discoveries as proving that the Creator can take care of a larger number of animals than we were before aware of ; and thence deduces the argument that He could in like manner extend His care to the inhabitants of other worlds. Another cannot admit the existence in other worlds of progressive intelligent beings under a moral government, because he can form no idea of such beings without making them identical with man ; as though it were necessary that his limited terrestrial imagination should be able to entertain such an idea.

Another draws an argument from some words in one of the Hebrew Psalms, and in order to do so attaches to those words a meaning which they need not bear ; he assumes that their writer was directly inspired with a knowledge of other inhabited worlds, such inspiration it seems being given him for the express purpose of writing words which would fail to convey their true meaning to those for whom they were written. Again he labours to attach a peculiar meaning to the word Heavens, shewing what one is almost tempted to call a wilful ignorance of the views of early astronomers, regarding the existence of distinct celestial regions one beyond another, in which were the Moon, Planets and Stars, each occupying its own particular heaven. In another place he commits a blunder which, however, common in the writings of inferior theologians, we hardly expect to meet with in a philosophical treatise ; he argues from a word in an English translation, attaching to it a meaning which if he had referred to the original, he would have found to be inadmissable. Such blunders and inconsistencies are such as we must always expect to be made by those who confound together theology and physical science.

There is indeed one argument drawn from religion which may present a serious difficulty to those who believe in the Christian Trinity, and in the mystery of man's redemption by the incarnation and death of one of its persons. This doctrine presents man in such a peculiar relation to God as seems scarcely to admit of repetition ; whilst at the same time it is hard to believe in the existence of an intelligent race under moral government, without assuming also the existence of good and evil, and the same necessity for a scheme of redemption as is held to exist in the case of the human race. To him who feels this difficulty we can only say that he may content himself with disbelieving in the existence of rational inhabitants in other worlds, until it is proved, and then it will be time enough to set about considering the difficulties which such proof introduces.

But leaving out, as unsuited to the present occasion, arguments deduced from revealed religion, let us proceed to those based on natural theology, or rather to the probabilities dependent on our own views of the Creator's attributes.

It is argued, God makes not planets in vain ; they must be meant for inhabitants ; it is impossible that amongst so many revolving planets one only should be inhabited, or that amongst so many suns, sources of light and heat, one only should be privileged to foster by that light and heat the vital functions of a world of life.

To this it is replied, that as for vast periods geology shews us that the world itself was uninhabited, so that there was an absence of life for unnumbered ages, so there may be a like absence of life for vast extents of space and for unnumbered bodies in that space.

But this answer loses all its force when we consider that although there may have been absence of, yet there was preparation for, life during those vast periods, and in like manner though all the other worlds may not yet be inhabited, yet they may be in a state of preparation for it.

To many minds it will be a more satisfactory answer to say, that as there are many things within our observation which we cannot account for, and for which we are unable to assign any motive, so we are not bound to assign inhabitants to the planets and stars, in order that they may not seem to have been made in vain.

What then is the conclusion to be arrived at after all that has been written on this highly interesting but highly speculative subject ? It may be summed up in a very few words ; Natural philosophy teaches us that there is a certain general similarity between the heavenly bodies and the earth which renders it probable that they too are the abodes of living creatures ; that there is nothing to disprove the existence of such beings, and at the same time nothing to prove it.

Natural Theology rather favors the idea of a Plurality of Worlds but is very far indeed from establishing its truth.

Revealed religion, or that which is believed to be such by a large portion of mankind, although it allows of the existence of animal life in innumerable worlds, is yet opposed in some degree to the existence of a race resembling ourselves in their higher faculties and in their relation to the Creator.

If the views which I have now stated are correct, as I know them to be candid and unprejudiced, the question of the Plurality of Worlds must remain for the present amongst the unsolved problems of philosophy.

He who can do so with impunity and has no better occupation for his leisure hours, may speculate on the nature and construction of the denizens of unnumbered worlds, with their various modifications of light, heat, gravity and substance; he who imagines he can thereby exalt his conceptions of the Creator, may allow his mind to wander with delight amongst myriads of worlds, all teeming with life, all full of intelligent beings, joining to swell the praises, and manifest the unbounded power and goodness of their God; whilst he who feels that any one doctrine of his cherished faith is in danger of being shaken by the admission of such an unbounded number of fellow-worshippers, may content himself with the reflection, that however hard an antagonist physical science may be, when actually opposed to religious dogmas, yet on this point it has proved nothing, and so far as we can judge will prove nothing which need shake his faith or alarm his conscience.

ON THE PROGRESS OF PHOTOGRAPHY AND ITS APPLICATION TO THE ARTS AND SCIENCES.

By James Freeman, Esq,

There are few pursuits more pregnant with interest to an enquiring mind than tracing from their earliest source those great inventions which have marked the advance of civilization, and by their means produced a new era in the annals of art and science, entirely obliterating the old plodding footpaths of the past and opening a grand highway for the advance of the industry, and talent of future generations of philosophers and mechanicians. Who in the middle of the seventeenth century, when they read the first crude idea of a steam engine, vaguely described by the Marquis of Worcester in his "Century of Inventions" could have foreseen in it the germ from whence was to spring that mighty power which was to revolutionize the whole world, spread its reign over the entire range of the manufactures of the universe and unite distant regions by its wondrous aid? The wildest dreams of the poets have been more than realized, and wonders greater than we read of in the eastern tales, wrought by its resistless power. When in prophetic view the poet Darwin wrote of its progress—

> "Soon shall thine aid unconquered steam afar
> "Drag the slow barge or drive the rapid car
> "Or on wide waving wings extended bear
> "The flying chariot through the fields of air."

even he most probably did not imagine how brief a period would elapse, ere the greater part of his prophecy would be fulfilled. It is with this feeling strong within me that I propose this evening to trace the science of photography from its earliest source and dwell more especially on its progress with regard to those of its branches which have rendered its application subservient to other arts and sciences, and have made it a pleasant adjunct to the happiness of the social circle. In furtherance of this design, I shall briefly allude to the early birth of photography and as far as I can within the limits of this paper notice, the various purposes to which it has been applied.

The chemical action of the solar rays, does not seem to have been turned to any account by the ancient philosophers; and the early Alchemists with all their subtle experiments only aided its progress by the production of horn silver, which certainly does form an important link in the chain, but absorbed in their anxious dreams of gold even they only record the simple fact of its properties of blackening when exposed to the solar rays and did not prosecute the experiment any further. Different experiments all relating to the action of light on the salts of silver were made by various philosophers, amongst them Scheele, Senebier and Count Rumford, but up to the year 1801, no important advance towards the great discovery seems to have been made, when Sir H. Davy and Wedgewood turned their attention to the subject and endeavoured to produce impressions from the reflections of the Camera Obscura, and in 1802, Wedgewood published a paper in the journal of the Royal Institution, under the title of "An Account of a Method of Copying Paintings on Glass, and of making profiles by the Agency of Light upon Nitrate of Silver, with observations by H. Davy." The result of these experiments was rendered abortive by their inability to produce any means of fixing the impressions, though even at this early stage one great point is noticeable which is, the application of photography to the copying of objects produced by the solar microscope. This was Sir H. Davy's discovery, and he observes on it "that nothing but a method of preventing the unshaded parts of the delineations from being coloured by exposure to the day is wanted to render this process as useful as it is elegant." Thus we may clearly ascribe to that great philosopher the honour of having invented the first application of photography the arts and sciences.

We will now pass over the experiments of the various savants on the effects of the coloured rays on different substances, as these experiments though they exhibit great scientific ardour and research do not immediately bear on the subject of this paper.

The foregoing rapidly sketched facts constitute the mere dawn of photography, the early grey of the morning, which preceded that glorious sunrise of the art, which burst on and illuminated the whole scientific world, when the discoveries of Daguerre and Niepce were first made public, and the early visions of Wedgewood and of Davy became realized as a fact. Niepce had died, and to Daguerre alone accrued the great glory of the discovery, his name became linked with the science he had elucidated. Philosophers hailed the new art with delight, and the public in general as they traced some familiar lineaments impressed on the magic plate gazed wonder-stricken at the production and thought of the good old days of superstition, when such an art might have bestowed on its discoverer the boon of the dungeon or the stake. Daguerre gained a large pension for publishing the process, from the benefit of which England alone was excluded; a large sum having been previously paid by Mr. Beard for its exclusive practice there, and he sold the licence for practising the Daguerreotype in England for large sums, limiting the licences to the country or districts he had chosen. I was under these terms one of the earliest practitioners of the art, having purchased the licence for the County of Somersetshire. This exclusive right

retarded the progress of photography in England, and some years elapsed ere it was superseded Mr. Egerton spent large sums in disputing its legality. Before referring to other branches of Photography, I will review the Daguerreotype process as to its capabilities for general application. While with skilful practitioners the Daguerreotype impressions were capable of great beauty and brilliancy of tone and views taken by the process, possessed aerial perspective and exquisite softness, yet the difficulty of the manipulation the many failures arising from atmospheric causes, the complication of the apparatus required for its production, together with the expensive nature of the plates, formed, important obstacles to its adoption by amateurs and to these objections may be added the difficulty, the polished surface presented of showing the impression in certain lights. All these circumtances I say prevented a more rapid advance of that process, yet still many interesting applications of the art were introduced. Mr. Claudet invented the photometer and the phocimeter for ascertaining the correctness of focus and measuring the intensity of light. A company was formed in Paris to establish Daguerreotype tours for the purpose of taking photographic views, from which engravings were to be published, and a series of experiments were instituted for converting the Daguerrotype impression into an engraver's plate by means of the action of different acids, aided by the galvanic battery, a great advance in this art was made, but the extreme delicacy of the impressed surface was such that no ink could be found free enough to give the required tones. I saw many specimens of these productions at Mr. Egerton's, but they were sadly deficient in half tones, and generally presented a blotched and sooty appearance. At this period an ingenious application of the camera was invented, whereby panoramic views could be produced on a long narrow plate; this was effected by giving the back of the Camera a curve, into which the prepared plate was bent and fitted, the lens being also provided with machinery which caused it to revolve in a small space at a corresponding curve; by these means a field treble or more the extent of the power of the lens was effected, and some pleasing results obtained; but the great objection to these was the necessity of their being inverted, as a reflector could not be adapted to this arrangement.

But it is now time to refer to a twin sister of the art, born at the same period, and ushered into the world under the auspices of one of our own countrymen. While Nieper and Daguerre were busy perfecting their photographic experiments, Mr. Fox Talbot was prosecuting similar researches on a widely different medium, and in 1839 published the result of his researches in Photography, which he named the Calotype, but which Mr. Claudet afterwards called the Talbotype, in honour of its inventor; which honour I may observe *en passant* M. Claudet's countrymen seemed somewhat jealous of, for when in Paris I observed paper photagraphs frequently labelled as "Daguerrotypes sur papier," an ingenious mode of appropriating the whole credit of the invention. Whilst comparing the merits of these two branches of the science, the palm must, I think, be awarded to Mr. Fox Talbot's discovery; apart from the trouble and expense of preparing the Daguerrotype impression, the power of indefinite reproduction on paper is in itself a most obvious advantage which the Talbotype exclusively possessed, and all the best and most useful applications of the art hinge upon paper photography; and it only wanted that delicacy of tone which the collodion process has since endowed it with, to perfect its beauties. By this process the moon and stars have been made to trace their own position in the heavens. The very changes of temperature, atmospheric pressure, and terrestrial magnetism have been made to register their own variations. The microscope has by its aid recorded its own wonders. Commerce has pressed photography into her service, and the manufacturer sends portable but certain illustrations of his productions within the limits of an ordinary envelope; in fact, the numerous applications of paper photography crowd so thickly upon us, like the figures that appeared to Macbeth in Banquo's magic glass, that it were vain to endeavour to enumerate them all, but true to my purpose, I will endeavour to select the leading and most interesting that present themselves, and having thus rapidly traced the different Photographic processes from their earliest invention, I shall endeavour briefly to review the most important of their applications to the arts and sciences.

One of the earliest practical applications of Photography was introduced by Mr. Fox Talbot himself, who published his "Pencil of Nature" a series of Calotype impressions of views and groups of artistic productions some of these possessed great merit but a deficiency of half tones is a general characteristic of these pictures. Mr. Talbot also astonished the scientific world by his instantaneous process, by which a printed bill pasted on the spoke of a wheel revolving rapidly was faithfully copied by the instanteous light obtained from the discharge of an electric battery. As I have before observed the crowning glory was given to Photography by the application of collodion to the process, this great invention is due to Mr. Archer and a most important part he plays in the history of this art. I well remember visiting Mr. Horne during the earliest days of its introduction and was then firmly convinced that it was *the* process which must eventually supercede all others. As I observed it is to the power of reproducing in any number correct or non-inverted copies from the original, that the Talbotype and the Collodion process owe their great superiority, and hence the many uses to which they have been applied. In the publication of photographic views alone, a great boon has been enjoyed by the public. The mighty works of the ancients, the glorious monuments of the classic ages, the sculptures of Phidias, the architecture of the great masters, have been familiarized by its agency, each noble pile is seen in all its grand proportions, not a stone misplaced, not a characteristic destroyed, and those, whose means and pursuits render visits to the spot unpracticable can view at a glance "deserted palaces of kings, arches of triumph long overthrown" in the true grandeur of the originals, and thus the mind is educated and elevated by familiar acquaintance with the highest works of art. So unerring are its powers that the progress of works may by its aid be inspected at a distance from the execution, thus in the case of the Emperor Nicholas, during the erection of the magnificent suspension bridge, over the Dneiper, at Kieff, he was enabled while at St. Petersburgh, two thousand miles from the spot, to inspect the progress of the work and successive photographs regularly forwarded to him at his palace, showed each stone as it was laid, and afforded him the means of effective supervision of the work. In the time of the Great Exhibition of 1851, how well photography did its spiriting. The Exhibition was immortalized by its aid, and that mighty fabric so speedily to be dissolved still lives in its numerous photo-

graphic representations. In the early history of the art, Mr. Fox Talbot especially dwelt on its power of copying manuscripts, so that thus copies of unique works might by the aid of photography be possessed by different institutions, and the risk of their destruction by fire, by which means so many valuable manuscripts have been utterly lost would be rendered almost impossible. Whilst on this subject I may observe that I once received a note from the Chief Justice, Sir Alfred Stephen, as to the practicability of copying the signatures to a deed, a most important use of the photography; for nothing can be more correct than its powers of imitation, and all photographers know, how impossible it is to play tricks with the delicate film of the collodion which at once exposes any attempts at alteration. The scene of a murder, the site of a disputed boundary would be more faithfully and intelligibly represented than by the hand of the modeller or the draghtsman and afford unerring testimony to aid the jury in their decision.

We all know how valuable a collection of portraits of illustrious personages may become. Lodge's portraits occupy a choice position in the best libraries and high prices have been given for original editions. We love to gaze on the lineaments of those who have rendered themselves famous in history. How many disputes have arisen as to the correctness of celebrated portraits. Shakespere's portrait has never yet been authenticated, yet we fondly believe in what has been handed down to us as his portraiture, and we trace with pleasure the lineaments of the warrior or the poet, the philosopher or politician, and strive to trace in their portraits the evidence of those intellects which rendered their possessors famous in their various capacities. Photography settles it all. Galleries of Poirtraits are now being published which will put the personal appearance of the leaders of our age beyond the reach of controversy; and the beautiful series of National Portraits, now publishing by Messrs. Maule and Polyblank, of which some specimens are here to-night, for inspection, will give the best evidence of the individuality of the celebrities of the nineteenth century. What portrait ever so familiarises us with the countenance of the Duke, the hero of a hundred fights as that exquisite one engraved by Ryall from Claudet's daguerreotype. In this branch of art, how important is its application, and how long could we dwell on its beauties, but other themes demand our attention. In Geology, in Geography, in Archeological research, how perfect is its aid. Antiquarians may inspect at a distance, the records of other societies; Photographic specimens may be exchanged, each inscription, each trace of decay, the groined arch, the sculptured monument unerringly depicted. The Geographers may trace the line of shore, the indentations of each bay, the outlines of high towering mountains, the declivities of each sloping valley all traced with a fidelity, it were vain to dispute. How rich the boon it bestows on the Geologist. No longer need the tried hand vainly strive to depict each wondrous freak of nature. Nature herself here illustrates her own handiwork. The researches of Buckland and of Cuvier, the luminous pages of Miller may be elucidated by the photographic art, each period exemplified, each successive stratum represented, unique specimens multiplied and compared with others in distant regions, fossil remains represented in all their minuteness of detail, reproduced as simply as a single line; no power could vie with Photography, no other art offer a substitute, and I can imagine nothing more interesting than Miller illustrated by photogrophy, one great truth aiding to elucidate another. Turn we to another sister science, Astronomy. Here Photography has indeed been busy; the Moon's borrowed light has been impressed into the service, and the pale Queen of night has been made to draw her own portrait, for we find that Mr. W. Crookes has received a grant of money from the donation fund of the Royal Society for this purpose, and has succeeded in obtaining dense negatives in about 4 seconds. It is not now my purpose to enter into a description of the "*modus operandi.*" I only collate results, the various scientific works on the subject give ample details, suffice it to say, Science has triumphed and photographs of the moon and stars are now facts in Photography.

Mr. Warren De la Rue, has also been very successful in this branch of the Art, he has obtained pictures of Jupiter and his belts, and attempts are now being made to take photographic maps of the fixed stars. On this head it has been said, I now quote from "Household Words" that "one of the Stars of the Constellation Lyra, "has already presented a photographic portrait "of itself, and it has been calculated from the "supposed but almost incalculable distance of that "star that the light took, more than 20 years in "passing from the star to the prepared silver or "paper surface, if so, this is perhaps the slowest "example of portrait taking on record." But these are the higher offices of photography, what think you of Photography as a detective, I believe that Mr. Gardiner of the Bristol jail, was the first who applied to the aid of photography for this purpose, but it is now frequently adopted. He took photographs of all who entered within his walls, the result is excellent, a prisoner escapes, copies of his photograph accompany the hue and cry and his identification is rendered easy. There is some doubt about the identity of a man convicted of some crime with that of a criminal in some distant country, a photograph settles the affair, some wart or peculiar mark seals the doubt and thus considerable trouble and expense is saved. It was proposed to enlist photography in the passport service, but I do not think it was effected. But I quote from the Year Book of Facts the following:—"A communication has been read to the Royal Society" on the application of photography to the Physionomic and Mental Phenomena of Insanity, by Hugh W. Diamond, M.D., of the Surrey Lunatic Asylum. He points out the advantages to be derived from photographic Portraits of the insane, as faithfully representing the features of the disease in its various forms, or its successive phases in the same patient, and as affording unerring records for study and comparison by the physician and psychologist. Whilst on this subject I may add to the triumphs of photography the aid it has effected in illustrating pathology, by the correct delineations it is capable of giving of the diseased parts; its power of illustrating anatomical preparations is unequalled; a series of anatomical illustrations in photography would be invaluable to the medical student and would doubtless prove an important book of reference to the older practitioner.

Amongst the many wonders of photography, none have been more productive of amusement and instruction than the stereoscope. This little toy of science, the joint production of Professor Wheatstone and Sir David Brewster, has opened a wide field for the photographer, and the many uses to which it has been applied would occupy some time in the enumeration. First and foremost is its power of representing views and groups in

all their solidity of appearance and natural perspective. The whole civilized world, nay, even its uncivilized parts have been ransacked for subjects and views from Cornhill to Cairo, aye, even from Indus to the Pole have become familiar as household things to snug fireside parties seated in their own rooms. Here you may see the temple of Minerva in all its grandeur of decay showing its beautiful proportions in boldest relief or the Sphinx smiling serenely over the Egyptian plains and pyramids, as it did ere those ages had gone by which the great Napoleon exhorted his soldiers to remember. The placid lakes of Como and Geneva, the wild mountain scenery of Switzerland stand out boldly beneath the magic glasses. The ingenuity and industry of the stereoscope company know no bounds as the myriads of stereographs sent over to this colony, bear ample testimony, nay, even the supernatural world has been invoked and a real ghost figures prominently in the list! A ghost, horrible to rustics and poachers as most of these groups testify. This little trick is simply managed, when the group is arranged a figure clothed in drapery is put in the necessary position, and withdrawn after a short portion of the necessary exposure in the camera has elapsed, the rest of the impression goes on after its removal, leaving a faint and shadowy outline of the figure on the picture, this is the ghost. I remember a trifling incident which occurred during my experience in portrait taking. A lady of a nervous temperament was sitting for her portrait and rose suddenly from her seat, during the period of exposure in the camera, I hastily closed the shutter and developed the picture, which turned out moderately good, but lo and behold her dress which was a plain silk one, presented a fine showy scroll-like pattern on its surface! How was this? The chair on which she sat, and which was covered with blue figured velvet, had taken its part in the tableau, and ere I could cover the lens had also imprinted its portrait or rather pattern on the lady's dress. This fully explains the mystery of the "Ghost in the Stereoscope.

In some of the published stereographs, the groupings are marvellous and show considerable artistic lack and skill in composition. Here you see a party leaving the church after a wedding, the beadle standing in stately grandeur at the porch, or within the church you may behold the wedding, or the christening, one group exhibits the interior of an Opera box, with the legs of the dancers advancing in the ballet—pictures from Punch are imitated and realized, and the love-tale or the sick bedside equally represented. How these groups can be produced, excites our wonder and curiosity, but great appliances are required. Painted scenery will not do as it has no stereoscopic effect, so that doors, windows, and arches must be modelled for the purpose, which must cause the necessity of having an extensive stock of costly appliances for their production, indeed, I am told by a gentleman recently returned from England, that one of these groups a scene from Robinson Crusoe cost near two hundred pounds for its production. Of course others are less costly, though nothing but the power of reproduction such as the collodiotype affords could repay such an outlay.

All this is for amusement, but the stereoscope ends not there. Commerce also claims its aid, and where of old the manufacturer carried costly and cumbrous specimens, of his art, a portable Stereoscope and a few slides afford the bagman the power of exhibiting his stock to his country customers. Thus the iron-founder may show his grates and stove, his iron gates, his balustrades, all solid as from the foundry. The goldsmith runs no risk in carrying costly stock, his goblets and candelabra, his bracelets and ornaments give their own impress in the stereoscope. While upon this subject I may notice, an improvement of the collodiotype process which bids fair to perform an important part in the history of the art. I allude to the various dry processes whereby prepared plates can be preserved, and exposed at any required period, and again laid by for developement at the convenience of the operator. The first of these processes was invented by Messrs. Crookes and Spiller, who in 1854, employed a bath of nitrate of zinc as a salt likely to retain sufficient moisture from the atmosphere to prevent the crystalization of the nitrate of silver, this was exchanged for the nitrate of magnesia as being less injurious to the nitrate bath, but shortly after Mr. Maxwell Lyte introduced a saccharine wash for the purpose and recommended grape sugar. This was again superseded by the honey process and Mr. Delwyn Llewellyn then introduced his oxymel preparation, which I think possess advantages over the others and seems likely to become practically useful. I have taken pictures on plates, prepared by this process, which have been kept three weeks and obtained good impressions, the chief fault being a tendency to produce stains on the plate, and also to make the film rotten so as to cause it to break in the washing. Another objection also is the prolonged time of exposure in the Camera. Mr. Frank Haes who arrived in August, by the European, brought plates with him, prepared by the patent process of Dr. Hill Norris, which seem to act very well, but they also are liable to imperfections in their developement probably from the length of time they have been prepared and the changes of climate they have undergone. In moderation these plates seem endowed with great preservative powers and tourists need only carry with them a camera and box of plates all ready for use which they can expose as occasion requires and develope on their return from the tour. I can imagine few things more pleasing than after a return from a long and interesting tour, to see the scenes you had gazed on with wonder and delight developing themselves under the magic fluid.

> Hills, cupolas, fountains, called forth every one
> Out of darkness as if but just born of the Sun.

Such a favour as this of reproducing and perpetuating past scenes must possess a great charm in the eyes of the amateur in photography. I have tried a form for preserving prepared plates, and believed it to be a very good one, as the process is simple I will describe it. After preparing your plate as usual, wash it well in distilled water, then pour over it a preparation of albumen and distilled water in equal parts, wash it again in distilled water and set it to dry. Develope as in the other process. The advantages of these dry processes are such, that I need not dilate on them now, but as I know several amateurs have been trying them, I trust if any such are present to-night they will communicate their experiences. Amongst other pleasing results of photography stand pre-eminent the impressions taken from microscopic objects; these objects always so pleasing and instructive can be easily copied by an adaptation of the camera to the eyepiece of the microscope, either by sunlight or through the agency of an artificial light. I have copied sectional cuttings of wood and other transparent objects by the light of an ordinary magic lantern, and hope still further to prosecute these experi-

ments as they are both highly interesting and instructive, in fact, a portfolio of these impressions would be very valuable if carefully taken and judiciously selected. The extreme delicacy of the collodion film has also afforded another interesting object for the microscope. A photographic impression taken so small as not to exceed the square of a small pin's head, will when submitted to the microscope, present all the features of an ordinary picture. In this experiment the delicate, texture of the collodion film is strongly exemplified as I know of no other substance, perhaps albumen being excepted, which could stand so severe a test as microscopic examination.

During the late war the science of Photography was frequently applied, and doubtless considerable advantages might accrue from its use. An enemies, defences might be photographed, and correct plans of many fortifications obtained; previous to the late war many experiments were made, and Captain Scott, of Plymouth, was employed by the government to make experiments as to the possibility of obtaining instantaneous impressions of the coast from the deck of the ship while sailing, and several important results were obtained. Mr. Fenton's photographic expedition to the Crimea has given some of the most faithful illustrations of that campaign and will remain strong historical records of events the traces of which will soon be obliterated, when Sebastopol is rebuilt and the devastations of war repaired. Whilst upon this subject I remember a singular anecdote related to me by Captain Wright, of the Victoria Mail steamship, and which will not be out of place here. Whilst in command of a ship conveying the sick and wounded from the Crimea to Constantinople, he was landing some French invalids at that Port and being a dabbler in photography he was making some experiments during the disembarkation. While this was going on, one of the priests called his attention to a poor fellow, and told him he would give him an opportunity of taking a portrait if he availed himself of the moment when the cross was held up before the sick man. This Captain Wright did, and was shocked to find that during that short interval the man had expired. However, he took the plate and on pouring over it the developing fluid, the face of the dying man and the cross which were in strong sunshine became quickly visible, all the rest of the picture being indistinguishable, but as Captain Wright observed owing to his want of skill in using the cyanide, the picture quickly vanished, leaving only the cross, which being bright was strongly impressed on the plate, and this stood out alone on the glass. This singular circumstance made a great impression on those around, and the Captain observed that the priests did not fail to attribute to it miraculous agency. I have the good fortune to be able to bring before you to-night some specimens of a new and beautiful application of the art, I allude to the prints produced by the Photogalvanic process invented by Mr. Paul Pretsch of Vienna. These pictures bid fair, to supply the void long existent in photographic pictures, and should the art be reduced to perfect practical operation it will I think form the keystone to the photographic art. Indeed the art of engraving by photography or rather of transferring the photographic impression to a metallic plate which shall reproduce the photograph in a form combining the unalterable qualities of an impression from a fine line engraving with the delicacy and fidelity of the finest positive print, must be of the highest value as it entirely sets at rest the durability of photographic impressions. This process which is based on the peculiar properties of glue and gelatine, mixed with chemical ingredients and rendered by the influence of light, more or less hard and soft, as Mr. Pretsch observes, "These substances can be made raised and sunk, can be kept soft or made firm, can shrink, swell, and become enlarged or magnified—certainly properties valuable enough to attract our full attention, and these properties form the principle of my method." By means of these constituent parts, a matrix is formed and from that the plate is produced by galvanic action. As I before observed, it is not my purpose to-night to describe processes especially one so complex as this which would form the subject of a long lecture in itself. I merely notice it as a valuable discovery and lay the specimens before you. Whilst upon the subject of Photographic engraving, I may allude to a very easy and effective process by which artists may etch their own designs and print them by photographic agency. I have myself adopted it and can strongly recommend it to those who wish to multiply their designs, and practice the very interesting pursuit of etching. The process is very simple. A plate coated and sensitized in the usual way is exposed to the open sunshine, and then submitted to the Pyrogallic developer and Cyanide fixing, in the ordinary method. By this means an intensely opaque plate is obtained and if the Collodion be good a beautiful surface is produced whereon to etch your designs with a fine pointed needle. When the etching is finished, a transparent hard varnish is poured over it, and the impressions printed and fixed in the usual manner. Some prints produced by this process are on the table.

Having thus traced the progress of photography from its earliest birth, when like a small mountain spring gushing from its source it meandered gently through the plains of science, gradually increased by fresh contributions from tributary springs till it forms a mighty stream to swell the great ocean of philosophic research, we must acknowledge how important a science it has become. The greatest of philosophers have made it their study. We have seen it aiding alike the meteorologist and the astronomer, the physiologist, and the pathologist; it has become an adjunct to the pencils of the artist and the burin of the engraver. We have seen it depict the delicate tracery of the microscopic object, and the mighty machinery of the engineer, in fact as a writer in the photographic journal has observed "That it "can be an aid to justice, a preserver and extender "of intelligence, a nurse of social affections, an "exact copyist of things removed by distance "from general observation, and an exponent of "the better feelings of human nature, on the "widest and most comprehensive scale, are "qualities which exalt it to a very high position "among the greatest discoveries for the welfare "and happiness of mankind." With such a field for its developement who shall attempt to define its limits? True it is that like all other great inventions it has been subject to abuse, in its train have followed many who could not appreciate its charms, who lacked that sense of the beautiful required to develope its artistic excellencies, but if carefully and judiciously applied how manifold are its beauties. To use Photography without studying and appreciating its capabilities would be like placing the delicate tools of a watchmaker in the hands of a quarryman or a field labourer. Each advantage requires to be studied, the various effects noted and applied, the angle at which the light falls with the finest effect, the hour of the

day at which different objects can best be taken, the choice of situation so as to modify the optical deficiencies of the lens and the intimate acquaintance with the effects of the various chemicals; all these must be studied and understood before photography can be successfully applied in producing artistic effects, or the results so frequently obtained must ensue. These deficiencies are too often ascribed by the uninitiated to the radical defects of the art rather than to inexperience and want of taste in the operator, and if this be the case in landscape photography, how much more must it affect the productions of the tasteless and inexperienced dabbler in portraiture. As with the soulless gazer on the beauties of nature.

"A primrose on the river's brim,
A yellow primrose is to him
And it is nothing more,"

so with this class the mere impression of the features is all that is sought for or produced, and hence the sightless eyes, distorted limbs, and huge fists that figure in photographic portraiture. With care and an educated taste on the part of the artist, and what is of great importance, patience on the part of the sitter, the most perfect results can be obtained both in artistic effect and correct proportional drawing, but as in the case of landscape subjects, there are certain effects not suited to photography, and which should be carefully avoided. I know of nothing more efficient in advancing the art and aiding those who delight in its practice than the opportunity afforded on occasions like the present, for communicating results and experience to each other, and on this present occasion we are especially fortunate in enjoying the opportunity of inspecting such various and beautiful specimens, which have been brought to this colony by those gentlemen, who have lately returned from a visit to Europe and have enriched their portfolios with those very splendid productions which we see around us to-night, and from the inspection of which I must not further detain those present. I have felt the subject expand as I wrote upon it, and am aware I have very imperfectly detailed the numerous applications of the art, but I trust the subject may at a future period be treated on and more fully elucidated, than it has been in my power to do, within the brief limits of this paper.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

XXIII MONTHLY MEETING.

Held in the Chamber of Commerce, Sydney Exchange.

Tuesday, 7th December, 1858.

Members of Council present:—Messrs. William McDonell, P. L. C. Shepherd, H. K. Burnell, R. Driver, E. K. Silvester, J. Graham, W. Carron, John Black.

Mr. E. K. Silvester in the Chair.

Minutes of last meeting read and confirmed.

HONORARY MEMBER.

The Secretary informed the meeting, that the Council had elected Mr. Charles Ledger, an Honorary Member of the Society, for the distinguished services rendered by him to Australia, in the introduction of Llamas, Alpacas, and Vicunas and that Mr. Ledger had accepted an invitation to be present this evening, but on account of being obliged to leave for Liverpool to-day, with his flock, he was prevented from attending.

PAPERS READ.

The Secretary read a paper from Dr. Gunst, on the Candle Nut.

ALEURITES (TRILOBA.)

Mr. T. W. Shepherd stated the Aleurites would stand the frosts of this climate which he could vouch for from personal observation, having seen them growing in the colony of South Australia, as well as in the vicinity of Sydney.

Mr. H. K. Burnell said, that he thought if the Candle Nut could be established in this colony it would be found of nearly as much value as the olive.

A vote of thanks was accorded to Dr. Gunst for his valuable paper.

On account of the absence of Mr. W. Redman, the reading of his paper was postponed to the next meeting.

NOTICE OF PAPERS FOR NEXT MONTH.

Mr. W. Redman—On the necessity of Roads to keep pace with the necessities of Agriculture wherever public lands are disposed of.

Mr. Robert Meston—On Storing and Preserving of Grain.

The next monthly meeting will be held on Tuesday, January 4th, 1859.

THE CANDLE NUT.

Aleurites Triloba.
Croton Molucanum (De Lin).
Aleurites Triloba (De Forster).
Aleurites Molucanum (De Bertero).

This tree belongs to the family of *Euphorbiaceae (Monvecie Monadelphie De Lin)*, it grows in abundance in New Caledonia, more so on the east-coast than on the south, also in the interior. In the Society Islands there are great forests of these trees, their average height is from 70 to 90 feet, and their dimensions are from 3 to 4 feet diameter, the trunks are brown and much wrinkled on the lower part, smooth and gray on the upper part with white spots. From the bark flows great abundance of transparent gum, resembling very much the gum Senegal and taste nearly similar. The natives of New Caledonia, in the interior eat this gum for catahrr.

The leaves are large, of a clear bright green colour, quite smooth on the surface, silver white and hairy (or *tomenteuse.*) On the other side,

they are supported by petioles, from 1 to 1½ inch in length, with two small yellow glands on the place of insertion from the branches; the flowers are *(Monoiques)*, small and of a pale yellow colour, and are formed like grapes on a straight stock of a grey colour, hairy about an inch in length, these grapes bear flowers male and female, the male flowers are much longer than the female, they are distinguished a dark gray colour *(tomentense)*. The (*Corola*) or the round envelope is formed of 5 petals yellow colour, much longer than in the female flower, these petals are grooved and split at the part they are attached, to 5 yellow glands which are inserted in their receptacle, the female flowers offer about the same color regarding their floral envelope. The ovary is unique surmounted with two stout short stiles, there are two or three lodgers, in each is one seed closed up. The tree bears fruit and blossom at one time.

The yield of oil of these nuts, will be 75 per cent. of a clear color, burning freely without smoke or smell, beautiful for the finest paintings and is of a drying quality. It can be manufactured 30 per cent. cheaper then Linseed oil. The oil is known in Commerce as *Kukui oil*.

I planted some on the 2nd September, and I shall be happy to communicate the result, if it should prove any interest to the Society.

I request you will excuse my very imperfect translation from the French to the English language.

I remain, dear Sir,
Yours respectfully,
J. W. GUNST.

Blackwall, Richmond River,
22nd September, 1858.

THE following papers were read at the monthly meeting of this Society, held on the 3rd July, 1858 :—

HYBRIDIZATION OF PLANTS.

BY T. W. SHEPHERD.

I have chosen for the subject of this paper some remarks on the hybridization of plants, with a view of explaining the practical utility of the art (for the practice of hybridizing has now reached that degree of perfection which entitles it to be considered as such), I cannot do better than read to you, without comment, a page or two from Professor Lindley's "Introduction to Botany," where hybridization is physiologically treated upon and explained, because it would be useless for me to attempt to explain the theory of the art in a clearer manner than has been done by that eminent writer and great botanist. [Mr. Shepherd here quoted at considerable length from the work mentioned, explaining the theory of hybridization.] The greatest perfection that has yet been attained in hybridization must undoubtedly be accorded to amateur florists. By crossing two varieties of certain colours, the hybridizer can almost to a certainty, predict the colour of the offspring of his operation; in fact, by anticipation, he could produce a painting of his expected flower with nearly as much certainty of correctness as if the flower itself were before him, and as easily as an artist can determine what colour will result by the intermixture of any two or more given colours. This result of course only applies to the particular class of plants which the operator has made his principal study, and, so far as yet proved, only applies to some families of florists flowers, and some bulbs, not included under that head. It is to be regretted that the amount of study and experiment which has been devoted to the production of new varieties of plants only ornamentally useful has not existed to an equal extent in the more material branches of vegetable cultivation, as in timbers, corns, grasses, fruits, and culinary vegetables generally. While regretting this, it must not be understood that I mean to say that nothing has been done in this respect towards the improvement of field and garden plants, on the contrary, it cannot be denied that a great deal has been accomplished, as instanced in the numerous and distinct hybrid varieties of apples, pears, peaches, plums, cherries, gooseberries, currants, figs, oranges, grapes, melons, and others amongst fruits; cabbages, cauliflowers, brocoli, turnips, carrots, pumpkins, cucumbers, and many others amongst culinary vegetables; and wheats, barleys, rices, oats, peas, beans, and numerous other pulses, grains, and grasses amongst plants cultivated in the field.

It is not necessary that I should enter upon the discussion of the wonderful alteration which cultivation produces in plants, further than to remark that amongst many of our best known domesticated plants such an extraordinary metamorphosis has resulted that no one except a profound botanist can recognise the origin from whence they sprung, and that this result is not attributable solely to the cultivation of the sole, but in a great measure arises from hybridization, either artificially by the hands of man, or accidentally by natural causes, such as may be brought about by insects, birds, or winds.

I am firmly of opinion that the power of great improvement in most of our cultivated plants is within our reach, and when hybridism shall become better understood and experiments more generally made still more surprising results will follow. Comparatively young as this colony is, yet in England some of our best known genera, such as the various species of the beautiful epacris, and corræa, have already been by hybridizing so much improved upon as to far surpass in beauty all the species of those genera known in their native country, notwithstanding the draw back of climate with which the cultivators had to contend.

As far as I am aware there is not a single fruit or grass indigenous to Australia *cultivated* for the use of man, while there are many to be found which present as eligible a starting point as did the origin of the most useful corn, or herb, or the most delicious fruit. Let us then set about experimenting, and who knows that results may not ensue which would render the term "barren wilderness," and "desert," often applied to our country, no longer even apparently true.

As an example, I will mention one of our indigenous fruits, which appears to me to offer reasonable grounds for hoping that, by judicious cultivation, and hybridization a delicious fruit might be produced, and the experiment would not require a great deal of time to prove. The plant I allude to is known as the "native raspberry" (*Rubus Eglanteria* of botanists), and plentifully found along the shores of New South Wales, from Shoalhaven to Wide Bay. The fruit of this raspberry (for it is a true raspberry, although of a different species from any cultivated one) is larger and finer looking than the well-known English fruit, but not nearly equal to it in flavour, although commonly eaten by the colonists, and not so bad either, as your humble servant can testify from experience, having had many a feast of them, while resting, sheltered from the rays of the mid-day sun, during fatiguing rambles in searoh of new specimens of

plants. I would propose to endeavour to procure a cross between this raspberry and the English one, which being accomplished, there would be good reason to hope that the variety so produced, partaking, as it would be almost sure to do, of the character of both parents, would be equal, if not superior, to the best raspberry in cultivation, having this advantage over others, that it would be adapted to our climate.

ORCHIDS.—BY MR. C. JESSUP.

Being a great admirer of orchids, I take the liberty of laying before you a short statement of my progress in getting together these lovely, most interesting, and most curious plants, in the hope that it may be the means of inducing persons like myself, of limited means, to cultivate a tribe of plants which has been almost entirely neglected in this colony. I believe I am correct in stating that, when I was gardener to W. S. Macleay, Esq., of Elizabeth Bay, I was in this country to get together anything like a collection and cultivating them with anything like success, and which I may here state, cost my employer a mere trifle, compared with what other gentlemen were at the same time paying largely for importing them from other parts of the world. It is now three years since I relinquished my profession of gardener, and now therefore consider myself as merely an amateur, and as such I feel some pride, in being able to lay before you so respectable a list of specimens of this tribe at present growing in my possession, and which, I believe, many gentlemen who employ gardeners would be very proud to possess. It is not longer than sixteen months from this date since I laid the first brick for a small hothouse, for the purpose of cultivating this universally favourite plant. The house has what is termed a "lean to" roof, which is glazed with common glass, as is the front, facing the west, and the end facing the north, and is heated with a common furnace and smoke flue, running the full length of the house, with a path or gangway in the centre, and pits and tanks on each side; the length is 16 feet; breadth 10 feet; height 11 feet in centre; and of front 6 feet; and the cost of the whole materials was just £20. Of course I was my own bricklayer, carpenter, painter, and glazier. Since this hothouse was finished my collection has increased to that extent that I have been compelled to build another hothouse to make room for them. This house has a span roof with wooden sides, heated by a brick smoke flue from the same furnace as the first, and only cost me £5 for materials. I think the abovf will show the trifling expense at which houses oe this description may be erected in this colony, and which will answer the purpose equally as well as the large and costly conservatories and plant houses of England.

My collection contains 121 named species and varieties, besides upwards of 50, the names of which I have as yet been unable to ascertain, and many of which I have reason to believe are undescribed and new to science. I also have a very good collection of native Australian orchids.

I would be most happy to make exchanges for other kinds of orchids than I have in my collection, but would be unwilling to part with any for a money consideration. However, at the same time, I am willing to purchase from any one on reasonable terms.

I have not alluded to the cultivation of this tribe of plants, but will do so with much pleasure at some future time.

I have brought with me a small plant, which I have recently received from England; it is called *cyprepedium spectabilis*, and is the first that has flowered in this country.

A TREATISE ON SHEEP BREEDING AND WOOL GROWING IN THE AUSTRALIAN COLONIES.

BY THOMAS SHAW.

II.

(Extracted from the Darling Downs Gazette.)

For many years back there has been no such crossing, the sheep have become more climatized —Australian in character; there has been a practical improvement in health, their constitution gradually recovering; the weight of fleece increasing, the wool rising in price, the carcass growing larger, the propensity to fatten improving. In fact, the flocks within the last few years have so much improved that from lowest they have become the most valuable of all the colonies. The universal spread of the Scab, and consequeut enormous loss of stock in Victoria has, for a season, put a stop to their improvement; but if the producers pursue the course they have been doing—breeding from colonial rams—as the scab disappears, all will be redeemed. Import extensively foreign sheep and all is lost. I am quite satisfied in my own mind that a very great improvement is to be made in the weight of carcass, still keeping up the quantity and quality of wool by paying proper attention to breeding, but of this subject I hope to treat in my next.

The disease called the Catarrh carried off the sheep in thousands, in some cases whole flocks in a few days. The disease is simply inflamation in the glands of the neck and head—a disease most likely, of all others, to take place from a change from dry and hot, to wet and cold. Weather in animals so completely reduced as these sheep were by the contention caused by opposite natures being brought into contact, the anxiety of masters to clear themselves of such stock may be readily imagined; they were sold and sent off in every direction, taking with them not the disease, for that would never travel any distance, but the constitution prepared to receive it. Port Phillip being then in its infancy, and sheep being required for breeding purposes, large droves were sent there, thousands dying by the way, others after their arrival. Every case of Catarrh in Port Phillip can be traced clearly to the sheep and their offspring from the Sydney Districts. A very large quantity of the flocks in that district are the produce of these cross-bred sheep—all the worst and most unprofitable are such. The Catarrh has entirely disappeared from Port Phillip, the reason is simply this, disease and death. The breeders after a few years experience and heavy losses, were convinced they were wrong; they were disappointed in all their expectations, their anticipations of immense profits turned out in many cases a dead loss. They saw no way to remedy it but breeding back; their discarded fine rams were again brought into use and others got; thus, as is generally the case, "one extreme begets another." Not paying the least attention to the rules laid down by all the most experienced and successful breeders, in defiance of the elements of nature, a series of crosses took place to the entire destruction of all distinction of breeds and the loss of all character; thus, these sheep, bad in every sense, wool, carcass, and constitution the most unprofitable ever bred in the colonies, except the original Bengals, even these, although to me better in wool being

half Kemps, were stronger in constitution and free from disease. For proofs how completely the constitution of these sheep were broken up, I have only to refer to the scenes of disease and death which took place throughout the whole of those districts where the cross breeding occurred. This was the case in the abovementioned sheep—no yolk, from their exhausted state, this provision of nature ceased. This accounted for the dry wethers, tender nature, and growth of the wool. When grass was plentiful and the weather mild the sheep managed to exist, but it must be very abundant and rich in quality for those to get anything like fat; when they did so, of course having a larger frame, they were heavier than the smaller breeds—but there was no more mutton in proportion to the weight of bone. When a dry season came with scarcity of food (such events being of common occurrence in these colonies), these animals could not stand the fatigue necessary to procure the quantity of grass to support them. The distance they had to travel was *too great*, they became exhausted; in this state they were liable to become inflicted with disease, weather being sufficient to bring it on. I have known whole flocks afflicted by camping in a valley or on a flat, the night turning suddenly cold or foggy after a warm close day; thus, the groundwork was laid for what invariably produces a weak sickly wool—a healthy *constitution* one the *reverse*.

If at any time a healthy sound sheep is attacked with any casual sickness, which frequently happens from cold, severe weather, long drought, and lambing, &c., the wool produced during such time is under a degree corresponding to its severity, whilst the other parts of the staple are strong and sound. But the wool grown upon a weakly constitutioned sheep is tender in all parts, from the top to the roots of the staple, there is no soundness met, the slightest pull broke it on any part as if the wool was dead or rotten. This was exactly the case with the wool produced by the above injudicious cross-yolk, and is another true sign of the health of a sheep; this is a peculiar provision of Providence produced by wool-growing animals alone, and supplied for the sole purpose of nourishing and supporting the wool during its growth.

In sound healthy sheep, the yolk is abundant rich, clear, and bright; in a less healthy, more scanty, thin, and dull; in a sick sheep, none at all. The offspring of this cross was what might be expected—irregular, misshappen, huge animals without any character except bad, both in wool and carcass.

The cross was far too severe for sheep so dissimilar in character—the two breeds did not assimilate, some of the offsprings having more of the character of the sire, some of the dam. Thus these so deservedly far-famed breeds of sheep by being brought into contact in a foreign country, bring themselves in a declining state—one from a mistake in breeding—the other from a climate not congenial to its nature, produced a breed entirely without character, destitute of every good quality, for which their parents were justly famed. All these entirely disappeared, nothing remained but their defects.

To those who have paid the least attention to the elements of nature, it requires very little consideration to perceive that the animal so entirely changed in character by the influence of opposite extremes, being forced together, must suffer severely in constitution during the operation—so the result proved. Wool is as true an index to the constitution of a sheep, as the tongue of a man is to the state of his stomach. A weakly constitutioned sheep, under these impressions, and without the least consideration as to the extreme difference of the two breeds of sheep, they were about to cross; it was universally tried. Never was there a bolder attempt to force nature than this, and the consequence was, as usual in these cases, a complete failure. Previous to this, all the breeders required was fine wool. In order to get this without any reference to quality, they had selected for breeding and raising rams the finest and consequently the weakest and delicate sheep in the flocks—the consequence of this for a series of years was, that the sheep became small and weak. The wool was fine but too light and tender; this evil was to be remedied by a cross with English sheep—and thus two extremes of nature were brought in contact under the most unfavourable circumstances. The finest sheep in the world, from the extreme eagerness of the breeders to grow fine wool—very much reduced in size and strength—*crossed* with the coarsest and heaviest, in a declining state, from the influence of a climate not adapted for its nature, in order to change its character—*was a great mistake*. Weak, entangled, hard, dry kind produced here—they falling off in quality, gradually went so, until the whole fleece became one irregular mass of hard, dry, entangled fibres, without distinction of parts, every vestige of the English character was gone. What was gained—a larger sheep? Yes! much larger, in bone and frame, with long coarse legs, flat ribs, long herring back, the mere skeleton of its English parentage. The early propensity to fatten was quite gone—so much so, that on many runs it could not be fattened at all; and only on the best runs, and in the best of season would it get into any condition. It was impossible for animals to be so reduced and changed without their constitution being greatly injured. That this was the case to a very serious extent we have numerous and lamentable proofs—the baneful effects of which have not only been felt by the importers and breeders of these sheep, but more or less in all parts of these Colonies—Maneroo, and the districts around, including Molong and Braidwood—being much colder in winter than many other parts to the breeders; there the English sheep were strongly recommended as more suitable than the smaller and finer breeds, and it was argued that a cross with them would not only increase size but strengthen the constitution.

They imported—but never was there such woeful mistakes made or carried to so great an extent in any country, or one so injurious to the character of the flocks themselves, or the interests of the breeders. The sheep proved much too large for the pasture, and of a character not suited to the climate. These beautiful sheep bred for and so admirably adapted to the cold, moist climate, and rich pasturage of England, became so on the scanty pasturage, and dryer warmer climate of Australia mere shadows of their former selves—the qualities both of wool and carcass which made them so profitable in England, were all lost here. The fine large carcass shrunk, and had the appearance of a large framed person in a decline, the bone remained, but the round full healthy aspect was gone. The fact was, these sheep were far too *coarse and heavy* for the soil and climate of these colonies. The two were at variance—there was a contest between two opposite natures—neither the sheep nor their masters were able to change the nature of the climate. But this all powerful agent of nature would either kill or change the sheep, which it most certainly did. The change first appeared in the wool—instead of the long, sound, free, clear,

moist, healthy wool, grown in England, there was a mistake of these breeds rather than carcass. From them and their crosses great expectations were formed from the amount of combing wool which was to compensate the grower (although coarser) more in weight than the amount lost per lb. in price would do, likewise giving him a larger carcass, with a greater propensity to fatten. These importations were recommended by parties in *England*, not by legitimate buyers and manufacturers of wool, but by London Agents, who know nothing of the subject in question, and as little of the general character of these colonies.

The sheep breeders in Australia, at that time, knew little or nothing of the effects caused by intermingling different breeds, but took it for granted that these London Agents thoroughly understood the matter. The manner in which stockholders out here went to work showed clearly their incompetency to judge for themselves; instead of cautiously experimenting on a small scale, they entered largely into the various breeds of English sheep.

The rapidly increasing demand for meat, arising from the great influx of population into these colonies, is creating an alarm in many quarters that in a few years, under the present system of breeding stock, the supply will not meet the extra demand—this suggests the necessity of means being speedily adopted to increase the supply.

I perceive from the *Argus* paper that various means are suggested as the most likely to supply a much larger quantity of meat, especially mutton.

Some parties have strongly recommend the extensive cultivation of *artificial* food for fattening purposes, but more especially the introduction from England, although a coarser, still a much larger sheep, gaining, when fat, a greater amount of mutton—such breeds as the Leicester, South Downs, Teeswater, Lord Weston's, and Cotswold, &c.

(To be continued.)

Scientific Gossip.—From the *Athenæum*, September, 1858.—A valuable sample of seeds of various sorts have reached Kew Gardens from Dr. Livingstone. Of these we shall hope to hear something from the learned Curator, under whose superintendence these Gardens have made such progress in beauty and usefulness.—The mission of Livingstone reminds us of another African traveller, Dr. Vogel, into the nature of whose death our Consul at Tripoli has been ordered to institute inquiries. This is the result of a request made to Queen Victoria at Berlin, by Alexander von Humboldt.—The more august traveller that is now majestically crossing the skies, has had his way heralded on several evenings, before dark, by the appearance of meteors of great brilliancy and various hue. It is averred, that in October Donati's comet will be visible at noon-day, through a good telescope. The diameter of this sublime visitor is set down at 3,000 miles, with a length of tail amounting to 15,000,000 miles. Its distance from the earth is only eight times the length of this magnificent tail. Donati's comet has rendered the general public indifferent to Encke's, "the Mercury of comets," to see which a man must be up very early, or not in bed till very late. These comets, however, have their respective admirers among astronomers, just as, among scientific men of another class, the Enfield and the Lancaster rifles have their respective patrons. An improved method for loading the former was supposed to have rendered it perfect; but recent trials have proved that the "Lancaster" is so constructed that a man cannot shoot ill with it, unless voluntarily. —There are, too, other sorts of antagonism in science, just now, particularly among the friends of alleged discoveries. Thus the friends of Mr. Beattie, of the London and South-Western Railway, claim for him the merit of a priority of discovery of the advantages of using coal instead of coke in locomotive engines.—Admiral Sartorius, again, writes to say that the idea of a steam battering-ram ship was conveyed by him to the French and English Governments, at the opening of the Russian war. The inference is, that Napoleon the Third's "*vaisseau belier*" is only a plagiarism.—In more quiet matters of science we find the *Journal des Débats* contesting the right of Mr. Pouney to be considered the inventor of printing in carbon, and alleging that the idea, at least originally, was M. Poitevin's. Another process, having this photographic end in view, has been hit upon by MM. Garnier and Salmon—a process depending upon the adhesion of lamp-black to citrate of iron which has not been exposed to the light. We are informed that this process does not differ in principle from those of Mr. Pouncy and M. Testard de Beauregard, except in the substitution of citrate of iron for bichromate of iron, and in the mode of working.—A difference of opinion as to merit of originality is further entertained respecting the discovery of the electric telegraph. Mr. Morse's claim is considered by American journalists to be inferior to that of Dr. Jackson of Boston, the celebrated inventor of etherification. The editor of *Cosmos* (a French scientific journal) considers the rights of Mr. Wheatstone to the honour of priority as incontestable.—Finally, the *Débats* claims for a French dentist, Simon, the invention of an electro-magnetic apparatus for the painless extraction of teeth.—To pass to other paths of science, we may notice that an invention has been patented for preparing the surface of an engraved copper-plate, so as to render it capable of yielding a greatly increased number of impressions. It is stated that upwards of ten thousand impressions have been taken from a plate thus prepared.—We conclude this bundle of Scientific Gossip by an extract from the 'Report of the Commissioners of Sewers,' the importance of which will be equalled—so we trust—only by the immense practical good to be derived from it:—"We have (says the 'Report') in common wood charcoal a powerful means of destroying the foul gases of sewers. How it is to be applied is a question of but little embarrassment. Ventilate the sewers as you will, either by the open gratings in the streets, or by the rain-water pipes of the houses, or by the pillars of the gas lamps, or by tubes carried up at the landlord's expense from the drains of every house, or by special shafts in the public streets—in fact, let the gases go out of the sewers how they will and where they will, you have but to place a small box containing a few penniesworth of charcoal in the course of the draught, and the purification of the air will be complete. As far as we know, the strength and the endurance of this power are almost unlimited; so that when once the air filter has been set up it will last continuously for years. Its action also upon the draught is not particularly injurious. The temperature of the sewers, and the agencies which are now at work in circulating the air and ventilating them will be sufficient to keep up a current of foul air through the filters, and if these were multiplied to a large extent, the friction of the gases upon the charcoal would be reduced to an insignificant amount."—The applica-

tion of electricity for producing local anæsthesia in tooth-drawing is creating a considerable sensation. The *modus operandi* is thus described by Mr. Kincely Bridgman, of Norwich. The apparatus is simple, and consists principally of the common electro-magnetic machine used in medical electricity, a single cell and pair of plates constituting a Smee's battery, and a small electro-magnetic coil with a bundle of wires for graduating the strength of the current. One end of the thin wire conveying the secondary current is attached to the handle of the forceps, and the other end of it to a metallic handle to be placed in the hand of the patient. The instrument touching the tooth completes the circuit, and the current passes instantaneously. The wire attached to the forceps should be made to pass through an interrupting footboard, so that the continuity of the wire may be made or broken in an instant by a movement of the right foot of the operator. The advantage of this arrangement is, that it allows the instrument to be placed in the mouth without risk of producing a shock in coming in contact with the lips, cheeks, or the tongue, which would interfere with the quiet of the patient. A hole drilled in the end of the left handle of the forceps and the end of the wire tapered to fit rather tightly allows the substitution of one pair of forceps for another with scarcely a moment's delay. The importance of this subject is so great that numbers will, doubtless, immediately have recourse to it, so that we may soon expect its real merits to be fully ascertained.

Prof. M'Coy, who is Director of the Museums of Natural History, Geology and Agriculture, (Victoria), has lately received from Europe many excellent models of European mining machines, which are now exhibited in the museums, and attract much attention. The museums are admirably arranged; and Prof. M'Coy from time to time adds some new feature, interesting and valuable in a country where mining machinery is but little understood.

A Board of Science has just been constituted in Melbourne, Victoria, to advise the Government on all matters for the consideration of which special scientific or technical knowledge is requisite. The names of the members are published in the *Government Gazette*. They are as follows:—The Hon. Andrew Clarke, R.E.; The Hon. Chas. Pasley, R.E.; Prof. M'Coy, A.R.C. Selwyn, Esq., Government Geologist; F. F. Mueller, Esq., Government Botanist; C. W. Liga, Esq., Surveyor-General; G. C. Darbyshire, Esq., Engineer-in-Chief of Railways; T. Skilling, Esq., Director of Model Farms; R. Brough Smyth, Esq., Director of Meteorological Observatories.

There are now about twenty-five meteorological stations in Victoria, at altitudes varying from 30 to 2,000 feet. From the disposition of the observatories much information is obtained respecting the "hot winds." There does not appear to be very much difference in the humidity of the hot wind, either on the mountains or on the plains,—but the temperature is generally greater at the tower stations. There appear to be very great differences in the amount of rain. On the seaboard, and on the dividing range, the fall is much greater than on the low level plains, bounding the south-western basin of the Murray. The great and disastrous floods which visited New South Wales in August, 1857, did not extend to Victoria.

CORRESPONDENCE.

To the Editor of the Sydney Magazine of Science and Art.

SIR,—Your November number contains a notice to me from Mr. Robert Meston, and it is a fair specimen of the mode of treating subjects, for trying to remedy which the Rev. W. S. Scott is entitled, in my humble opinion, to the thanks of your readers, but more particularly of the members of the Societies whose proceedings you report. Nothing can be more injurious to improvement and the progress of science in a young country like this, where the means of obtaining accurate information are so very scanty, than the constant practice of giving, as well ascertained *facts*, opinions not only unsupported by a shadow of reason or argument, but also, as in the present case, antagonistic to direct experiment, thus the writers themselves defeating the very object they have in view. Seeing the extremely easy way in which some solve difficulties, and judging from their papers that I am rather rusty on chemistry in general, I was careful in my letter on Agricultural Chemistry in your August number, to give no opinion of my own, save that if one action of bones, either burnt or unburnt, be the retention of moisture, that effect is destroyed with the organism of the bone by the use of sulphuric acid. And this, because I thought there could not be two opinions on it. Mr. Meston says practical men are of that opinion. There is, therefore, no need to say more on that point. But he also tells us, "in dry soils or climates, the moisture-retentive properties of crushed bones *semi-decomposed*, constitute not the least of their excellencies." Now some of your readers can easily satisfy themselves by reference to Liebig's work referred to in my former letter, that this assertion, as already said, is at variance with experiment; but as that work may not be accessible to all, I shall give a few quotations which I think will prove it is so, although many parts of great value must be passed by, lest the severing of them from the context renders them unintelligible.

"During the years 1845 to 1849, I (Liebig) made a series of experiments on the action of the different mineral manures on a considerable scale, on a piece of land of about ten English acres, which I purchased with this object from the town of Giessen. This land—a sand-pit to the east of the town—I found to surpass all others in the whole surrounding district in its nearly complete barrenness for the ordinary cultivated crops. I do not believe that in a whole year there grew, naturally, as much grass or other fodder as would have sufficed for a single sheep. The soil is in part a light sand, in part it consists of more or less coarse pebbles and thin strata of sand, with some loam."—Page 40. "The state of solubility or available form in the mineral constituents has the greatest influence on their efficacy, and this is, for example, the reason why the hard compact, and not porous apalite (natural phosphate lime) in equal quantity, exerts a far less effect in the same time than burnt bones, and why the effect of the latter is so greatly increased when they are rendered more soluble by means of sulphuric acid." "Phosphate lime dissolved in dilute sulphuric acid is very generally applied to the land, at least in England, and it is a question whether this form of application be not preferable to all others."—Page 66.

"During my travels in England in 1842, I had become acquainted with the great deposits of coprolites* in that country, and by analysis I had

* Excrement of fossil reptiles.

detected in these remains of an earlier period, a large quantity of phosphate lime. This was, for British agriculture, a great and hitherto undiscovered treasure,—a mine as it were of a substance for which, in the shape of imported bones, Great Britain was necessarily tributary to foreign countries. The thirty-fifth letter of the English edition had no other object than to direct the attention of British farmers to this treasure. My advice has borne good fruit. A manufacturer of coprolite manure assured me when I met him at my friend Dr. Daubeny's, in Oxford, in 1851, that he alone had supplied the market with this manure—coprolites dissolved in sulphuric acid—to the value of £50,000; but also that a much larger quantity was prepared by farmers on their farms, and used by them on their own land."

Your readers will see from the last quotation, that the opinion also of practical farmers is that the phosphate lime (or its equivalent) and *not* "the moisture-retentive properties of bones constitutes not the least of their excellencies." Were it not so, £50,000 is much too large a sum to pay to one individual, but that is a flea-bite to the sum total paid for similar manures. And if that were not the opinion, would the host of manure-makers constantly select the per centage of some phosphate (the equivalent of bone) in preference to that of any other constituent of the manure as a criterion of its value? But how about dry climates? Does the same law obtain in these? To this the reply is, that nothing short of experiment entitled to the fullest confidence can warrant the adoption of a different one. I must not omit naming, that Liebig gives the experiments made in England by Messrs. Pusey and Laws, and Dr. Gilbert, over a period of at least 7 years, on a great scale and cost, and which these gentlemen thought clashed with his own views, but Liebig proves satisfactorily and completely to Gregory, Playfair, Daubeny, and others, and partly so by their own admission, to his opponents, that they *confirm* them. In my former letter you have made me say the "16 propositions" *instead of* the sixteenth proposition, and "Richard Meston" *instead of* Rham, Meston, &c.

I am, sir, your obedient servant,

OSSIC.

METEOROLOGICAL TABLE.

NOVEMBER, 1858.

OBSERVATORY, SYDNEY, LATITUDE 33·52 SOUTH; LONGITUDE, 151·12 EAST
HEIGHT ABOVE THE SEA, 145 FEET.

DAY.	BAROMETER CORRECTED TO 32 DEG. FRNHT.		WIND. DIRECTION.		WIND. FORCE		TEMPERATURE MAX.	TEMPERATURE MIN.	CLOUD EXTENT.		INCHES IN RAIN	REMARKS.
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M.	9	9		
1	29·787	29·598	N.N.W.	N.E.	1	1	66·8	49·7	0	1		Fine throughout
2	·449	·802	N.N.W.	S.	3	3	84·0	59·7	9	10		Gale from W.N.W. in the forenoon; wind S. at 4 p.m.
3	30·017	30·081	S.	S.S.E.	3	2	63·2	54·5	10	10		Cleared in the afternoon; cloudy after sunset
4	·103	·041	E.	N.N.E	2	3	69·3	51·2	10	9		A few drops of rain in the even.
5	·000	29·927	N.N.E.	N E.	2	2	71·7	60 8	9	5		Cloudy day; cleared at 10 p.m.
6	29·960	·850	S.S.W.	0	2	0	77·0	60 6	4	1		Lightning to W. at night; heavy dew
7	·675	·701	N.	S.	1	5	85·9	61·2	3	0	·015	1 p.m. violent squall, with hail; 8 p.m. strong S. wind
8	·865	·981	S.S.E.	S.	2	3	68·8	58·2	10	10	1·177	10 a.m. a few drops of rain.
9	30·021	30·050	S.E.	S.S.E.	2	2	67·1	57·7	10	10		Light rain began at 9 a.m.; occasional light showers
10	·097	·099	S.E.	N.	3	2	69·0	56·6	9	10	·072	Very light showers [dew
11	·047	29·956	S.S.W.	N.E.	1	2	69·4	54·9	8	0	·021	Cleared in the afternoon; heavy
12	29·887	·855	E.	0	1	0	75·0	54·5	0	8		4 to 4·30 p.m. thunder-storm from
13	·811	·718	W.	S.	1	1	79·4	62·9	10	10	·060	Rain from 3 p.m. [S.W.
14	·546	·584	S.	S.S.W.	3	3	70·1	61·8	10	1	·544	Ceased raining at noon
15	·659	·696	S.	S.	3	1	73·1	60·2	1	5	·091	Fine throughout
16	·730	·770	S.	S.	2	2	71 8	61·2	6	10		Fine; cloudy night
17	·702	·568	N.	N.E.	1	3	76·9	61·1	3	8		Thunder-storm 6 p.m.; light
18	·688	·754	S.S W.	S.S. E.	3	1	71·6	63·5	10	10		Fine [shower
19	·841	·881	0	N.E.	0	3	72·0	59·8	7	4		Fine
20	·956	30·015	N.E.	N.E.	3	4	73·5	58·0	2	1		Fine; strong breeze all the after-
21	30·117	·117	E.	N.E.	3	3	77·0	60·8	0	0		Fine throughout [noon
22	·095	29·955	E.N.E.	N.E.	3	4	76·0	60·1	0	0		Fine; high wind at night
23	29·886	·776	E.	N.E.	1	1	85·6	59·9	0	0		Fine
24	·757	·695	W.N.W.	S.	3	4	99·0	69·1	0	0		Hot wind: squall from S. 7·30 [p.m.
25	·976	30·149	S.	S.	4	2	67·6	58·4	10	3	·018	Light showers from 7 a.m.
26	30·151	·101	S.E.	S.E.	3	2	68·6	53·6	9	10	·012	Cold and cloudy all day
27	·081	·031	E.S.E.	N.E.	1	3	71·2	57·1	6	10		A few drops of rain in the even.
28	29·999	29·894	E.N.E.	N.E.	2	4	69·2	57·0	10	10	·106	0·30 p.m. heavy showers; rain at night
29	·760	·609	N.E.	N.E.	4	3	66·2	60·5	10	10	·163	Showery all day
30	·534	·519	N.N.W.	S.W.	2	2	79·8	61·0	1	10	·205	Light showers 0·30 p.m.; thunder and heavy rain, 9 p.m.
Mean.	29·873	29·859			2·1	2·3	73·8	58·8	·61	·56	2·484	Days Rain—14.

The extent of clouds is represented by the number of tenths of the whole sky, obscured at the time of observation
The force of the wind is represented according to the Observer's judgment, by numbers from 0 to 6, 0 representing a calm, and 6 a violent storm.

Registrar General's Office,
Sydney, 8th December, 1858.

HEALTH OF SYDNEY.

The number of Deaths registered at the Central Office during the month of Novem ber was 176, viz.:—97 males and 79 females. Of these, 84 were under the age of 5 years. Diseases of t he Zymotic class have been more than usually fatal, and of this class, Scarlatina and Dysenteric complaints make up the greater proportion. Teething and convulsions have been amongst the most fatal causes of Infantine mortality.

The number of Deaths registered during the corresponding month of last year was 116, and in 1856 was 90. The number of Births registered during the month was 160, viz.:—92 males and 68 females, being 16 less then the Deaths.

TABLE SHEWING THE DEATHS OF MALES AND FEMALES REGISTERED IN EACH WARD, FROM 1ST TO 30TH NOVEMBER, 1858, DISTINGUISHING THOSE UNDER 5 YEARS.

WARD.	UNDER 5 YEARS.			ABOVE 5 YEARS.			GRAND TOTAL.
	Males.	Females.	TOTAL.	MALES.	Females.	Total.	
1.—Gipps	10	7	17	13	8	21	38
2.—Bourke*	6	3	9	16	7	23	32
3.—Brisbane	5	5	10	4	2	6	16
4.—Macquarie	4	2	6	1	2	8	9
5.—Cook	7	7	14	4	4	8	22
6.—Fitz Roy	2	10	12	4	7	11	23
7.—Phillip†	6	3	9	7	8	15	24
8.—Denison	4	3	7	4	1	5	12
TOTAL	44	40	84	53	39	92	176

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1ST TO 30TH NOVEMBER, 1858.

CAUSES OF DEATH.	Under 1 year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25	25 and under 30	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75	75 and under 80.	80 and under 85	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages.
ZYMOTIC DISEASES. Endemic, Epidemic, and Contagious	10	4	4	8	1	27	4	...	...	...	1	1	2	1	1	1	1	...	...	...	...	1	...	...	...	...	40
SPORADIC DISEASES. *Of Uncertain Seat.*—Dropsy and other Diseases of variable Seat.	12	...	...	...	...	12	...	...	...	...	1	...	4	2	3	...	1	1	...	...	...	...	...	...	...	...	24
Of Nervous System.—Diseases of the Brain, &c.	15	5	...	1	2	23	3	...	...	...	1	...	1	2	...	1	...	...	...	...	...	...	...	...	...	...	31
Of Respiratory System.—Diseases of the Lungs, &c.	3	1	1	...	1	6	1	...	1	2	3	1	4	2	2	2	...	...	...	...	...	...	...	...	...	...	24
Of Circulatory System.—Disease of the Heart and Blood-vessels	...	...	...	...	...	...	...	1	1	1	2	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	7
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	9	7	...	...	...	16	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	18
Of Urinary Organs.—Diseases of the Kidneys, &c.	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Generative Organs.—Childbirth, Diseases of the Uterus	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	2
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	3
Of Integumentary System.—Diseases of the Skin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Old Age	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	2	1	1	...	1	...	...	...	8
External Causes.—Violence, Privation, and Intemperance	...	...	...	...	...	...	...	1	...	1	2	3	...	...	...	3	...	...	...	...	...	...	...	...	...	1	11
Unspecified	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	7	8
Total from all Causes	49	17	5	9	4	84	8	3	2	4	11	6	12	8	8	9	3	4	2	1	1	1	1	..	...	8	176

CHRIS. ROLLESTON, Registrar-General.

FUTURE PROSPECTS.

THE extreme stagnation in all departments of trade which exists at the present time, ought to induce every well wisher of the colony to look carefully at its possible resources, with a view to develop new paths for industry and fresh avenues to wealth. It cannot be doubted but that the metropolis is suffering very severely. The complaint is universal that times are hard, and the retail traders are loud in the lamentations. Rents are falling rapidly, and ere long labour must follow.

That the pressure should be felt first in Sydney is what might have been expected. A very large proportion of the population are employed simply in the distribution of articles of luxury, and as these in times of scarcity of money are the first things that are sacrified, those who live by them furnish a sensitive monetary thermometer. The drapers, jewellers, the publicans even, are believed to have suffered severely of late and to have experienced great difficulty in meeting the heavy rents which are still demanded for houses in good situations.

In proportion to the population and extent of the colony, it must be confessed, that Sydney is greatly over-populated and over-shopped, and it is vain to expect any considerable amelioration in our circumstances, until some of the now productive hands which hang uselessly behind the counters of our shops, and are half employed in our mercantile offices, are employed in raising wealth from the soil.

The agricultural statistics for the last year show a lamentable falling off in the number of acres under crop in wheat. In the year 1856, there were 106,124 acres; in 1857, only 89,195 acres and the product of the first year was, 1,756,964 bushels, while the product of 1857, was only 1,289,044. It is difficult to account for this deficiency, for, with an annual increase in the population of 20,000 souls, there should be a constant progression in place of decay.

If we look at the statistical return of the manufactories, works, &c., in the colony for the last three years, it is apparent that we are losing ground. In 1856, there were 54 tanneries in the colony; in 1857 there are only 49; in the former year there were 16 iron and brass foundries; in 1857 only 10; in 1856 we possessed a fleet of 60 steam vessels; in 1857 we are informed there were only 46. We regret that we are not able to carry out these statistics to the present date, but they are not furnished by the Government as yet. We fear they will tell a still more depressing tale.

Well then, if our agriculture is declining, if our live-stock, upon which the colony has hitherto mainly depended, is diminishing (as the Governor-General recently clearly showed that it is), and our manufactories are decreasing, it is difficult to see how the colony is to be supported in some few years. It is true our gold produce is increasing, and roads are gradually being opened up into the interior and from these two facts, especially the latter, we are still inclined to augur favourably of the future of New South Wales.

The mineral wealth of this country independent of gold is enormous. Our coal fields at Newcastle are yet in their infancy and are daily increasing in importance. They have the extraordinary advantage of a natural highway—a navigable river and the ocean. But we have equal if not superior wealth in our iron and copper mines, which only await our long promised Railway Communications to place this colony far in the van of all the other colonies of the Australian group.

To our mineral resources as the most rapid producers of wealth, we believe we must first apply our energies and that we may do so, it is necessary that means of communication be opened up as economically and as speedily as possible.

In the meanwhile it will be well for our agriculturists, our vine growers, and wine producers, our stock farmers, and graziers, to bestir themselves. In the latter department alone, his Excellency has shown that a large and profitable business might be carried on. In the neighbourhood of Sydney artificial pastures might be prepared to fatten the half famished beasts that come in droves from the stations in the interior. Practical men assert this operation would be remunerative. We deeply regret that the effort that was so auspiciously made some time since to establish an experimental farm should have dropped, it was calculated to confer incalculable benefits on the colony

and some day, those who neglected to support it, will lament their indifference. There were many problems it might have solved. Under its auspices the Government might have purchased the flock of Llamas and Alpacas for which we are so much indebted to the energy and perseverance of Mr. Ledger, but which there is now great reason to fear that we shall lose through the want of enterprise so fatal to our prosperity.

We sincerely hope the project is not yet abandoned. The Government has given the land, and has made specific promises of help if the public will only help themselves. We would urge the Council of the Agricultural and Horticultural Society again to take up the matter and see if by a vigorous effort the necessary funds cannot be raised and the scheme fairly tried.

In spite of detraction both at home and abroad, we are glad to hear that our wine growing interest is gaining strength. We are assured that there is an open market in England, for as much sound colonial wine as can be sent home, and from bills and invoices sent home which we ourselves have examined, we can state that a very large price can be obtained for the finer qualities. When we consider what a field is here open for human industry, it is impossible to despair of the future of this country. It may be that the present high price of labour,—the present fictitious wealth will not continue, but it is certain that so soon as it is generally known that the land of this country, so admirably adapted as it is to the culture of the vine, can be had at nominal prices compared with those paid in France and Germany, we shall have an immigration of vignerons, glad to escape from the trammels and exactions of European governments, who will render Australia one of the greatest wine producing countries in the world.

The remedy then that we desire to impress upon our readers for the miseries which we fear, many are enduring in Sydney, is that all those who are able should press forward into the interior, and there, instead of exerting the muscles of a man, to measure out yards of ribbon, or retail bundles of staylaces, boldly set themselves to work to subdue the forest and to reap the harvest, with which a bountiful earth never fails to repay the labour of mankind.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

XXIV MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange.

Tuesday, January 4th, 1859.

Members of Council present:—The President, Messrs. W. Graham, W. Carron, H. K. Burnell, J. Dyer, W. McDonell, H. Waymouth, Thomas Walker, W. G. Ainsworth, P. L. C. Shepherd, Dr. Houston, and W. Deane, Honorary Secretary, and about one hundred and fifty members and their friends.

His Excellency the Governor-General in the Chair.

MINUTES.

Minutes of last meeting read and confirmed.

PAPERS READ.

The Secretary read a paper from Mr. Robert Meston, on Granaries and corn storing.

The President called upon Mr. Charles Ledger, who lately introduced the flock of Llamas, Alpacas, and Vicunas into the colony, to read a paper on the history of the Llama, Alpaca, and with notes of his journey through Bolivia and the Argentine Provinces into Chile, with the flock (or remainder of original) now in this colony. The following articles were exhibited by Mr. Ledger in illustration of his paper, a coarse cloth which the Indians strap across the back of the Llama when carrying burdens. Two sacks made from Llama wool used in transporting ores and wool from interior of the country. A hat made from the wool of the Vicuna, several small scarves made for the same. A quantity of leaves called by the natives cocoa. A stuffed specimen of the Alpaca being one of the first dropped in the colony together with ropes made from Llama wool, and a case containing stuffed specimens of the Chinchilla.

Dr. Douglas proposed a vote of thanks to Mr. Ledger, for the very able and interesting paper read by him, which was seconded and carried by acclamation. The President having conveyed the thanks of the meeting to Mr. Ledger, the same was acknowledged by him.

In answer to a question from the President respecting the duration of the

Llamas life, Mr. Ledger answered, that he believed it to be about fifteen years.

APHIS BRASSICA.

Dr. Douglas said, that he wished to corroborate a statement which he saw by the published transactions of the society had been made by His Excellency, of the disappearance of the Aphis after a heavy fall of rain, having observed the fact on a large portion of his estate.

EXHIBITS.

A New Hoya from the South Sea Islands exhibited by the Messrs. Shepherd of Darling Nursery, P. Williams gardener.

It was resolved on the motion of Mr. McDonell seconded by Dr. Douglas, that a silver medal be awarded to the above plant. Mr. John Ebert exhibited several bottles of wine made by him, on the estate of Alexander Berry, North Shore, vintage 1857 and 1858.

Mr. J. H. Williams also exhibited several ears of mummy wheat grown on the Terara estate.

NEW MEMBERS.

The following gentlemen were proposed as members by Dr. Douglas, seconded by Mr. E. Cox :—

Mr. Alexander Mackellar, Mr. Thomas Hawkins Smith, and Professor Pell.

PAPERS FOR NEXT MONTH.

Continuation of paper from Mr. Charles Ledger, on the Alpaca and Llama, with notes of his journey through Bolivia and Argentine Provinces into Chile, with the flock or remainder of original now here.

The next monthly meeting will be held on Tuesday evening, 1st February, 1859.

AN ACCOUNT OF THE LLAMA AND ALPACA WITH NOTES OF A JOURNEY FROM THE BOLIVIAN AND ARGENTINE PROVINCES INTO CHILI WITH A FLOCK OF THESE ANIMALS,

By Charles Ledger, Esq.

No doubt, most of my hearers will have availed themselves of the opportunity, that the arrival of my flock of Alpacas, Llamas, and Vicunas afforded, of satisfying a very natural curiosity, and after seeing them, formed their own opinions respecting this peculiar animal.

I will now endeavour to lay before my audience such knowledge as residence of 22 years in Peru and Bolivia, with a practical experience of 10 years in the breeding of the Alpaca has given me the means of acquiring, as also such other information as I have been enabled to obtain from different accounts published respecting it, the value of its wool as an article of manufacture, the quantity imported into Great Britain, and finally conclude with a brief account of the expedition that has at last placed so large a flock of this valuable animal on the soil of this country.

To commence with the earliest mention of the Alpaca we must recur to so early a period as the year 1525, when the famous Pizarro and his ferocious companions invaded Peru. It is stated by the Spanish historians that they found there four varieties of sheep : two, the Guanaco and the Vicuna in a wild state ranging the mountainous tracts of South America ; and the others, the Llama and the Pacos or Alpaca, domesticated. The former (Llama) of these domesticated animals partaking somewhat of the nature of the Arabian Camel, was in like manner employed as a beast of burden, in fact the only one they possessed, except when bipeds were compelled to perform the task of quadrupeds.

It is all but incredible, the number of these useful animals employed at present time in Peru and Bolivia as beasts of burden, and when I state that at least 600,000 are annually used for one or more journeys varying from 40 to 150 leagues without taking into consideration shorter ones of 5 and 6, my hearers will think that I am exaggerating, and hardly conceive that so much traffic, (to say nothing of that by mules and donkeys), can be carried on in the interior of a country as yet so little known to Europe. This is soon set at rest by analyzing such traffic, viz. :—

60,000—That annually bring down to Tacna from Con. the 55,000 qnts. of Barrilla, exported from the port of Arica.

15,000—That conduct Alpacas and sheeps wool, block tin, and tin ore, into Tacua.

20,000—Conducting provisions from the interior, such as potatoes, chuno or the dried potatoe, charcoal, fuel, dried meats, into the three principal cities of the Department of Moquegua—viz., Tacna, (capital) Moquegua and Tarapaca, with a joint population of 45,000 souls.

40,000—Conducting wool, Alpaca and sheep's skins into the city of Arequipa from the interior department of Puno and Cuzco, and shipped at Islay.

20,000—Provisions, as in Tacna for a population of 60,000.

10,000—Conducting wool from the interior to the Port of Chala—from the Provinces of Castro Vireyna, Parinacochas, and San Juan de Lucanas.

150,000—That from all parts of the Cordillera extract maize, flour, and wheat from Cochabamba alone and supply thereby the means of subsistance to some 600,000 souls.

50,000—That further to the north get their supplies for the year from Tarija, another beautiful grain producing valley for 250,000 souls.

50,000—That for the same purpose are thrown on the grain resources of Tupiza 250,000 souls.

30,000—Annually occupied in distributing all over Bolivia, the Northern Argentine Province of Jujuy, and the Northern Department of Puno in Peru, from La Paz the grand "depôt" of the Coca, product of the magnificent Tropical Yungas, (see the Coca leaves) the mastication of which leaves enables the Indians to endure heat and cold, hunger and thirst, long journeys on foot from day to day, with at times nothing else wherewith to support nature.

100,000—That from all parts of the departments of Cuzco and Puno, the former with a population of 346,211 and the latter 245,681, together 591,892 out of which 500,000 are inhabitants of the Puna or Cordillera that subsist principally on maize, wheat, and flour, carried from the grain producing vallies of the ancient and famed Cuzco.

50,000—Carrying grain for mines of the Cerro de Pasco.

50,000—Transporting grain from the valleys for the mines of Ayacucho and Huancavelica. These statistics are not difficult to obtain by a person knowing how to go about it, and having had the opportunities that I have had. I must inform you that all the grand thoroughfares through the interior of Peru and Bolivia are supposed to be *kept in order* by a small impost being put on every beast of burthen trafficking them, and as these are contracted for with the Governments of both countries, through the interference of the prefects in the different departments which they traverse, and by private individuals, a very exact account can be arrived at.

If then, 600,000 Llamas are annually used as beasts of burden, and for long journeys how many shall I say, are those occupied on shorter or daily ones? It is here that I am at fault and can find no accurate computation. What with the carrying of metals from the mouths of the mines to the amalgamating establishments, the carrying of "taquai" or Llama manure that answers the purpose of coal or fuel, to the Copper Smelting Establishments of Corocoo, Carangas, and Oruro, the tinworks of Sipisipi, and consumption in lieu of other fuel in many large cities, towns, hamlets, &c. I am sure that a much greater number of Llamas are employed than for the "long journey" transport, and without hesitation I might place this number at 1,200,000—thus we have nearly 2,000,000 of these animals employed as beasts of burden in their native countries. The wool of this species of the genus is exported in comparatively very small quantities; the wether males that are used as beasts of burden, are never shorn for the simple reason, that as their wool serves in lieu of the "pack" in mules and asses, they would have no protection from (if this were taken off) "galling." Now, then, suppose that 2,000,000 are employed as beasts of burden, and that each one would produce annually *only* 5 lbs., we have here accounted for the non-exportation of 10,000,000 lbs. The Indians are extremely averse to shearing the females, and give as reasons their proneness to premature birth of lambs and not being able to withstand the severity of the winter. Almost all the sacks for the transport of grain, taquia, flour, &c., are made from the Llama wool; and as these, one with another, weigh 3 to 4, and only allowing that 500,000 are *worn out* annually, we can place as consumed in the country about 2,000,000 lbs. To this estimate let me add another item, that appears, really insignificant at first sight, I refer to the "Soga," the cord by which the load is secured on the Llamas' back, and when we consider that one "Soga" will not last *over* two trips, and barely last so long as by practical experience, I know to be the case, and if 2millions of Llamas are employed annually, and each makes between, long and short, 2 trips we can easily account for the loss of further 2,000,000 lbs. Besides the "Soga" is taken for sale into the towns and cities and used in many ways, it is the only *cordage* used in the country. Many and varied indeed, are the household goods made from Llama wool in the Indian's hut—the "*chuse*" or carpet, bed-coverlets, "chuspas" or handy bags that range from "minimum to maximum" and not counted in those for the "carga" or out doors work—let us then suppose that the amount annually consumed and this consumption effected by a population of more than 2½ millions of souls; can I allow less than 1 lb. to each between carpeting, bed-covering, chuspas, &c., 2,500,000 lbs. Without entering further into the "home" consumption of Llama wool and so that my hearers may obtain a faint idea have I gone into these "minutiæ," you will see that the consumption annually of Llama wool in Peru and Bolivia, exceeds the enormous amount of 16 millions of pounds weight, and in all good faith, I firmly believe, that I am far under the proper computation. The very small quantity of Llama wool that is annually exported, as also the major part of that consumed in the country, is taken from the animal after being killed for meat. The meat of this animal as also that of the Alpacas is highly nutritious; the Indians kill off the old ones in their flocks from time to time during the year. The Alpaca wool being of greater value in a mercantile way, more certain in its demand for exportation, is why the Llama wool is more used in the country, and consequently to be met with rarely.

The same may be said of sheep's wool; comparatively speaking, a very small quantity is exported, if we consider the number of sheep that are in the country. The quality of the wool bears no comparison with the splendid wools that I have seen here, (the difference of price alone in the "world's mart" speaks for itself). Yet, I mean to contend, that South America is essentially a wool producing country; the home consumption is very large, as little, or say nothing is used in the Indian's hut of foreign manufacture, except the knives, buttons, beads, and for grand "gala" days a few yards of gay ribbons and coloured baizes,—all, the rest of their vestments both male and female are home made, and as above said the population being 2½ millions, and allowing for each only 2lbs. of wool a year we have a production of 5,000,000 lbs. Add to this amount the computed annual export to Great Britain, &c., of 2,500,000 lbs. we have a country producing 7,500,000 lbs. of wool, and let me impress upon my audience that, I here only speak of Peru and Bolivia.

The Alpaca, as the next domesticated animal, is of inferior size to the Llama, producing a much longer fleece, and softer in fibre, and in many other ways easily distinguished from the other species. In the 16th century, and even from the remotest times, the Peruvians, being comparatively (to the other tribes of the great continent of America) a civilised people, and well acquainted with the arts of spinning and weaving, fabricated from Alpaca wool, textures of much delicacy and beauty, which were highly prized as articles of dress. And that the use of them had prevailed for centuries is proved by the opening of very many of the "Huacas" or ancient tombs of the Peruvians, in which the dead had been enwrapped in stuffs made from the fleece of the Alpaca. The wool having risen in value and become an article of so much demand, little or none is at present manufactured in the country, or has been for the last 25 to 30 years. In general, the Alpaca ranges about 4 feet in height, the size of a full grown deer, and like it, is of graceful appearance. Its fleece is superior

to that of the sheep in length and softness, averaging 7 to 9 inches, and sometimes it is procured of an extraordinary length, such as the samples now shown, but you must know that these are the growth of 27 to 30 months. The fleeces when annually shorn, range from 7 to 10, 11 and 12 lbs. Contrary to experience in other descriptions of wool, the fibre of the Alpaca's fleece acquires strength without coarseness, besides each filament appears straight, well formed, and free from crispness, and the quality is more uniform throughout the fleece. There is also a transparency, a glittering brightness enhanced on its passing through the dye vat. It is also distinguished by softness and elasticity, essential properties in the manufacture of fine goods, being exempt from spiral, curly, and shaggy defects; and it spins, when treated properly according to the present improved method easily, and yields an even, strong and true thread.

With all these remarkable qualities, it was long before the value of Alpaca wool was known or appreciated in Europe. True, in respect of the beauty of its form and its docile nature, attempts had, more as a matter of curiosity, been made to naturalize in England this highly interesting animal, in the early part of the century. A brief narrative of several attempts will not be out of place. The first specimen of the Alpaca seen in England, is stated to have been in the possession of Mr. De Tastet, of Halshead, in Essex, so early as the year 1809. It was afterwards transferred for exhibition to the Surrey Zoological Gardens and continued there for many years. In the meantime, the Duchess of York maintained, at Oatlands, four or five Alpaca pets, but from none of these did any increase ensue. These Alpacas were sent from Spain as a present to His Majesty George the III. Being in Salta, 1856, I there fell in with Sor. Don Victorino Sola, who recounted to me the history of the flock, of which these five formed a part, the said Sor. Sola had charge of the animals some four months during their stay in the vicinity of Salta, more than 50 years ago. It is well known that up to the commencement of the war of Independence in South America, the Spanish sway was as arbitrary as unlimited, and yet with all its immense power it was unable to obtain that more than 70 Alpacas could be got to Buenos Ayres, out of 500 collected in Upper Peru, and of these 70, only 33 arrived in Spain. That none of these increased is well known, as also, that during the journey to Buenos Ayres, 2½ years, the Indians driving them effectually destroyed all reproducing power in the females.

In 1817, D. Burnett, Esq., of Faringdon-house, Berks, received a couple of Alpacas and from this stock, he succeeded in rearing 15 young ones.

Viscount Ingestre also, in 1825, imported two Alpacas which bred. They were shorn once or twice, and the produce being fabricated into cloth was, it is related, "of the finest texture possible." The Viscount eventually presented his flock to the Zoological Society.

The next person who devoted much attention to the naturalization of the Alpaca, appears to have been Thomas Stevenson, Esq., of Oban, Argyleshire, but he did not succeed in his endeavours.

Afterwards, the late Earl of Derby, entered into the enterprise with great spirit, and writing in the year 1841, to Mr. William Dawson, of Liverpool, who evinced great interest in the subject, expresses himself in this hopeful manner. "I certainly know of nothing likely to prevent "the propogation of the animal in this country. "On the contrary, the gentlemen visiting "Knowsley Park, will see in these grounds that "they can and will do so."

The flock of the Earl of Derby, eventually came into the hands of Titus Salt, Esq., who has devoted much attention to their management. He possesses upwards of a dozen, and after careful observation, has arrived at the conclusion that it is impossible to so far naturalize the species as to make it a stock animal worth the attention of the breeder. It can, indeed, endure heat and cold, but it is utterly unable to withstand, without more care than can be bestowed upon it ordinarily, the humidity of the climate of England. I perfectly agree with Mr. Salt, and firmly believe, that almost any country possessing, like New South Wales, a dry atmosphere will suit the Alpacas.

Recurring to the application of the Alpaca's fleece to manufacturing purposes in England, it was long delayed. Though so early as 1807, the British troops returning from the attack of Buenos Ayres, took with them a few bags of this wool which were submitted for inspection in London, but, observes Walton, in his work on the Alpaca, "owing to the difficulty of spinning it, "or the prejudice of our manufacturers, it did "not then come into notice." And for more than 20 years the attempt does not seem to have been renewed, thus depriving, for that period, the country of the advantage derived from this notable manufacture.

According to best authorities, the first person in England, who produced a marketable fabric made from this material—was Mr. Benjamin Outram a scientific manufacturer, of Greetland, near Halifax, who, about the year 1830, surmounted with much difficulty, the obstacles encountered in spinning the wool, and eventually produced an article which sold at high prices for ladies carriage shawls, and cloakings; but their value arose more from being rare, and curious articles than from intrinsic worth. These were, it is well established, quite destitute of the peculiar gloss and beauty which distinguish the Alpaca lustres and fabrics of later times, and after a short period the manufacture was abandoned.

In the year 1832, Messrs. Hegan, Hall, and Co., spirited merchants of Liverpool and the west-coast of South America, perceiving the value of Alpaca wool, purchased and shipped in Peru all the parcels of wool they could meet with. In 1835, the Congress of Peru decreed, "That statues of marble be erected in the "'Plaza' or Grand Square of Puno, to Joseph "Hegan, Esq., and Snr. Don Maro. Escovedo, to "commemorate the great advantages arising to "the department and the 'Nacion en General,' "by their spirited exertions to bring the Alpaca "wool into the European markets, as a perma-"nent article of 'exportation,' thereby opening "up a new and fecund source of wealth to the "most indigent inhabitants of the Republic, viz. "the Indians or 'Indigenas' of the Cordilleras."

When last in Puno 1852, I saw no monuments to the said gentlemen in the "Plaza Mayor"—the continued dissentions and revolutions in this distracted but over rich country, prevent any such decrees being carried into effect.

Until the introduction of cotton warps into the worsted trade, it may be safely averred that the Alpaca manufacture had not been developed, and would never have made much progress without being combined with cotton or silk warp. To Titus Salt, Esq., of Bradford, must, undoubtedly, be awarded the high praise of finally overcoming the difficulties of pre-

paring and spinning the Alpaca wool, so as to produce an even and true thread, and by combining it with cotton warps, which had then (1836) been imported into the trade of Bradford, improved the manufacture, so as to make it one of the staple industries of the kingdom; he has by an admirable adaptation of machinery, been enabled to work up the material with the ease of ordinary wool, and thus present beautiful Alpaca stuffs at a reasonable rate.

Most of the Alpaca wool taken into the United Kingdom, is unshipped at Liverpool, but a small portion is also carried to London. At these two ports, it may be asserted, the whole imported is landed. It arrives in small bales, weighing 60, 100, 150 lbs. The 1st. put up for Llama carriage. The 2nd. put up for Donkey carriage. The 3rd. put up for Mule carriage.

Dating from the year 1834, when the importation of Alpaca wool sprung up as a permanent branch of commerce, the demand in this country has, without exception, been a growing one. Mr. Walton, in his work on the Alpaca, exhibits the quantities exported chiefly to England, until the year 1843, when the traffic law having come into operation, the returns began to be more correctly framed, and the Alpaca wool was then classed by itself.

1834— 5,700 lbs.	1839—1,325,500 lbs.
1835—184,400 „	1840—1,650,000 „
1836—199,000 „	1841—1,500,000 „
1837—385,800 „	1842—1,443,299 „
1838—459,300 „	

Since the year 1842, the returns of Alpaca wool imported into Great Britain, are of a more reliable character. The following table has been drawn up from "data" furnished by the Board of Trade.

1843—1,458,032 lbs.		1851—2,013,202 lbs.	
1844— 635,357 „		1852—2,068,594 „	
1845—1,261,905 „		1853—2,148,267 „	
1846—1,554,287 „		1854—1,267,513 „	
1847—1,527,300 „		1855—1,446,707 „	
1848—1,521,370 „		1856—2,300,000 „	Data from Coast
1849—1,655,800 „		1857—1,800,000 „	Data from Coast
1850—1,652,295 „			

Astonishing as it may appear, the bulk of these importations have been consumed in England, and the quantity re-shipped to the Continent has been comparatively trifling in amount. We must yet allow some 500,000 lbs. shipped annually from Peru to France and Germany.

During the last 10 years, the prices have fluctuated considerably, from 1s. 8d. per lb. to 3s. 9d.

Mr. Ledger here explained why the exportation did not increase, giving as a reason that the poor Indians were subject to the most cruel exactions at the hand of the authorities, so that they are never anxious to appear to possess any wealth, lest they should excite the cupidity of their oppressors.

As beasts of burden, the Alpaca is little made use of, only in the mines of Huancavelica (quicksilver) are there mode to carry loads, I am told that they are equal to the Llama.

The Guanaco being the largest animal of the two wild species, I will treat of it the first. In appearance it very much resembles the Llama in size, the wool is much coarser, shorter, and intersected with hair, it is of one colour only, a dim red with black face. This animal is to be met with as far South as Terra del fuego, and north to the slopes of the Chimborazo. A few have been reared in a domesticated state as curiosities only; the wool is used by the Patagonia and Auracatto Indians, worked up into blankets, ponchos, &c.; the meat is highly esteemed by them, and all the Indian population through Chili, Argentine Provinces, Bolivia, Peru, and Ecuador. As the possession of this animal in my flock would only deteriorate the value of the wool, if intermingled with the other classes, I have studiously avoided having with me a single specimen.

The Vicuna, is a smaller, but more graceful animal of any of the species, its wool is finer than that of the Alpaca, but its yield is very small, never passing a pound a year.

I have succeeded in crossing this animal with the Alpaca, thereby produing the Paco Vicuna, with a wool partaking of the superior fineness of the Vicuna, with the greater length of staple of the Alpaca.

The animal is hunted down for its flesh and skin, and I have no hesitation in saying that 15,000 are killed annually in the "Corridas," for the value of their skins.

Having thus lightly touched on the different varieties of the Llama species, and given some faint idea as to its value, as a beast of burden, a wool and meat producing animal. I will now proceed to explain to my audience, how it was that I became possessed of the necessary knowledge that enabled me to carry out the enterprize, that under all circumstances considered, I cannot but think, (and in the opinion, the greater part of our countrymen on the west coast of America agree with me), has so far been successfully accomplished. In 1836, I arrived at Lima, and obtained a situation as clerk in the respectable house of Naylor's. I remained in Lima a little more than two years, and was then sent to one of their branch houses, Tacua, capital of Arica, one of the intermediate ports in Peru. The house was very extensivly occupied in the purchase of Alpaca and sheep's wools, and on my being sent there, I was immediately put in charge of that department, which comprised the receiving from the Indians the different lots as they arrived from the interior, the sorting the qualities and colours previous to packing, (which was done by the house), and finally shipping them, principally for account of Messrs. Christopher and James Rawdon, of Liverpool. Another part of the duty that devolved upon me after having obtained sufficient knowledge as to who to deal with, was the making of contracts, and these generally speaking with very heavy cash advances, to such parties as applied to us and to others, to whom we offered contracts; it is thus, that in early life I was thrown in contact almost daily with the Indian who in small lots sold to the large contractors and with these I formed connections, that lasted until 1852, when I last left Tacua, to commence *in reality* the present enterprise. In 1842, I started in business on my own account as a dealer in South American produce, still keeping up my connection with the Messrs. Naylor, buying the whole of their wools, and for more than three years, every cwt. of wool that was shipped at the Port of Arica, was pressed in my establishment. My former connections were greatly augmented at this time by marrying into a influential family in Tacna. My repeated journeys all through the interior of Peru and Bolivia, with the object of stiring up laggards in their contracts, and making fresh ones, sending down wools by the Indians on Llamas, bought up at different places, gave me advantages that I afterwards turned to account. In this year I obtained for different parties that applied to me for them, 1 lot of 6 Alpacas, another of 8—of these 14, I believe 10 arrived in Europe, 6 in France, and 4 in England. In 1844,

Messrs. Moens and Marriott, and Snr. Don Maro. Escovedo (then Prefect of the Department of Puno—shipped at Islay, sea port of Arequipa and distant from where the animals were collected some 120 leagues, 400 of these interesting animals, but I am sorry to say, if it be true all that I have been told, only three arrived in the Thames, and these only survived a few days. True it must be, as nothing was heard of any person possessing any of this valuable shipment. By knowledge, afterwards acquired, I am convinced in the first place, that the animals were very much over driven previous to shipment, that they were shipped without sufficient water or pasture; and secondly, that the pasture having been stowed on top of Guano, became impregnated with "ammonia," as also every thing else on board, and the animals, poor things, were poisoned.

For some months after this shipment, I was continually in the Corridas collecting, and sending wools down to the coast, and I well remember the lamentations in every Indian's hut on account of this shipment. Every disaster that happened was attributed to the allowing these animals to leave, and most undoubtedly had not Don Maro. Escovedo, an interested party with Messrs. Moens and Marriott, been prefect at the time of the Dept. so large a number could never have been collected. The Indians hold for this animal a superstitious reverence, and most firmly believe, that any sufferings the animals may undergo on being driven off their natural pasturage grounds, such as by hunger, thirst, and foot-soreness, and finally that death itself, if permitted by them will be visited on them and theirs. They shew the greatest affection for the Alpaca and Llama,—will it be owing to the great veneration they hold for the memory of their lost Incas? Their Incas taught them to weave and spin and clothe themselves from the wool of the Alpaca, both species were venerated in the Temple of the Sun, sacrifices were offered up before the sacred ones, which were tended and pastured by the Vestals of the Temple. They preserve mourning to the present day; in their "huainas," monotonous, plaintive songs, in these they extol the greatness and goodness of their Incas, and lamenting the cruel death of their last one "Atahualpa" call down maledictions on the head of the cruel "white face." There are many, very many reasons that lead me to suppose that ere many years elapse, attempts will be made by the Indians to recover their country and again bring it under the ancient dynasty; a legitimate descendant of the last, who rose in arms against the Spaniards in 1808, Gabriel Tupac-amaru living in the small village of Tungasuca, near to Cuzco, the ancient capital of the Incas; I must not occupy your time on this point, when I publish my intended work, you will find this and many other subjects fully entered into. I hope you and your friends will all "go in" for copies.

I will return to my subject. About the middle of 1844, a friend of mine in Tacna, begged of me to procure him 12 Alpacas, they were intended for Count Cambaceres. I did all in my power to serve my friend but only succeeded in obtaining eight—these were shipped in the "Arequipa," Captain Boulan, and 7 of them arrived in France.

The Indians would not listen to my pretentions, and I only got the eight from those that were owing me, and had no other means of paying me—the value of an Alpaca at that time was $3 or 12s. I had to pay $8 or £1 12s. each for those that I then procured with so much trouble.

I believe it was in September, of 1844, that the British authorities on the west coast were compelled to appeal to force, owing to repeated infractions of treaty by belligerant Generals, (the country being then in its semi-normal state of resolution), and by direct insult to the British flag in the port of Arica brought upon themselves a reprimand, in the shape of a few shells from the Cormorant war steamer; great animosity was felt all through the country against all foreigners particularly the English. This animosity was heightened when, in a few months afterwards the country being pacified for a time, and the congress having commenced its stitings at Lima, Her Majesty's chargè d'Affaires, made most peremptory demands for immediate satisfactory settlement of many pending claims. These demands were backed by the appearance in the Port of Callao of a considerable squadron of Her Majesty's ships of war. There were many belicose deputies, whose voices were for war, but eventually all demands were acceded to, and perpetual peace and amity were again the orders of the day. The wounded pride of the Peruvian Congress shewed itself in conceeding nothing to any petition that had a foreigner's signature to it. Previous to this time, yet only some three months before all this happened in Lima, (the bombardment of Arica as it was officially styled by the Peruvian Authorities took place the throwing four shells over the town, into the Governor's house (just to shew him that it was not exactly fun only), and another into the barracks, and by which no lives were lost.) General Yguain, then Prefect of Tacua stopped the shipment of some 40 Alpacas that the house of Messrs. Frederick Huth and Co., intended shipping to Germany, (I believe). The Prefect appealed to Lima for the Government to support his local decree, and the case being laid before the Congress, then sitting brought on the decree of April 5th, 1845, prohibiting the exportation of Alpacas in all the Ports of Peru, imposing very severe penalties on those caught infringing the law. This step on the part of the Prefect of Tacna, so readily taken up by the Congress of Peru, only gave strength to petitions that almost all the Southern Deputies had from their constituents applying for a law to prohibit the exportation of Alpacas, as the loss of all those shipped in the "Sir Charles Napier," was known and mourned over, all through the Cordilleras of Peru.

Several times from 1845 to 1848, were applications made to me by different parties, to get Alpacas out of the country, but as I well knew that any such attempt must be attended by difficulties of no ordinary nature I paid no attention to them. I began at that time to think that this valuable animal required being better known, and its habits studied, hoping that in course of time the decree would be annulled, or some revolution in the country would enable me to get them out through a Peruvian Port. In the beginning of 1848, I rented a large estate, Chulluncayaui, on the frontier of Peru and Bolivia and among other occupations, such as collecting wools, copper from Corocoro, and Peruvian bark, commenced breeding the alpaca; little by little I collected at first 200; all sorts of stratagems had I to make use of, to obtain these, and then they were old and many infirm ones; every means were devised by the Indians on the estate to prevent my breeding them, but after all, in 1851, I succeeded in being the possessor of more than 600. At that time the "Julia" arrived at Arica from Sydney, and of her unsuccess in obtaining the object of her voyage is too well known to my

audience; strange to say that the manner then pointed out by Mr. Nugent, Her Majesty's Consul at Arica, as the only one feasible for obtaining alpacas, is the very one by which I have succeeded in getting those I now possess *here*. In January of 1852 after personal interviews with Mr. Nugent, urged by Her Majesty's Chargè' d'Affaires at Lima, W. Pitt Adams, Esq., addressed me a note on the subject, stating that Her Majesty's Government considered it most desirable that attempts should be made to introduce the alpaca in large quantities into New South Wales, as one or two specimens would not call attention except as curiosities and from which no permanent benefit or good could arise. Conversing with Mr. Adams, in Lima, and so as to induce me to take his views of the undertaking among other points he appealed to my spirit of patriotism, and frankly told me that, as an Englishman, and the only one in the country able to do it.

(To be continued in our next.)

ON GRANARIES AND CORN STORING.

By Robet Meston, Esq.

Tum variæ illudant pestes,
—— Populat que ingentem farris acervum
Curculio.—Virg.

Granaries are usually buildings wherein it is intended to lay up or store corn of any kind, for longer or shorter periods of preservation. Sir Harry Wotton advised his countrymen to erect them so as they should look towards the north, for coolness. If that rule holds good, then Australian granaries ought to have openings towards the south or west. Strength and exposed situations are necessary properties in a good granary. Wheat is often kept for 30 years, and the longer it is well preserved by so much more flour will the grain yield in proportion to the gross weight, and by so much will the bread be whiter and purer, all superfluous humidity being evaporated by storage.

At Zurich, in Switzerland, corn has been preserved 80 years, by methods about to be described, although the utility of so protracted a series of years is not very evident.

On the other hand, few persons conversant with such matters will deny this truth, that wheat under a year old at least, will not, of itself, yield a loaf of first quality; and another fact, which may pass for a colonial aphorism, may be also stated, namely, that no white population of equal numbers consume so much bad flour and bread as the inhabitants of the Australian colonies. Hence the grinding up of all sorts at the mills, and hence alum or potatoes, or both perhaps, in the bread, to make the loaves spongy and white, with water and salt for additional weight, *ad. lib.*

Dantzic is the great store-house or granary to a large portion of Poland. The public granaries are said to be seven, eight, and nine stories high, each floor having a funnel for letting the corn down from one to another. Vessels come up to the walls for lading. The wheat, barley, oats, and rye are laid up in these repositories by parcels of from 20, 30, to 60 lasts, and men keep turning it every second day, in order to preserve the grain sweet and free from heating. A *last* is computed to be equal unto ten English quarters, or two loads. Wheat ought to be thoroughly cleansed or winnowed and deprived of all light or faulty grains previous to storage.

In many granaries of old England, when new threshed corn is brought into the deposits, it is laid down about six inches in thickness; turned thrice a week, and screened once in that period. For two months, the same treatment is followed; when the corn is laid up a foot deep. Thereafter, turning once a week and screening twice a month, are operations considered often enough, unless the weather should prove very damp. In six months, the grain will admit of two feet deep, with occasional turnings and screenings. After a year, the heaps are raised to a height of three feet, and turned once a month and so on. By so long, however, the grain is soundly kept—and by so much oftener the turnings and screenings are repeated—by so much better will the corn be found to improve. Besides airing and ventilation, it will be shewn, that other advantages are derivative from frequent turning, when discussing the subject of weevil, their mode of propagation and extensive depredations.

On the subject of farmers barns in this colony, it cannot be said that there is much room for congratulation. In general, their buildings are airy enough; but corn threshed in a damp state and left too long in the chaff, is apt to acquire a bad smell if it does not get heated. No evils attendant on the cerealia, as blasting milldews, rotting rains, bad stacking, &c., have a more detrimental effect than heating. The golden grain is all but ready for conversion into the circulating medium; all costs and risks and labour are nearly over; yet by carelessness—shear carelessness and neglect, half the recompence is annihilated at nearly the last stage, and all expectations of a *bright* sample are at an end by heating. It will be well if the owner profits by the first loss or lesson, and resolves on "better luck next time." Indeed, heated wheat, whether in the stack or in the chaff, is neither fit for seed, bread, nor for storing; and like to like for all other grain is the general law with little deviations. Barley will not malt, oats, refuse to grow, the flour of heated wheat, is bitter tasted, and maize so conditioned is scarcely fit food for pigs, and all by heating or mustiness.

Much has been said or written regarding due ventilation in granaries, air funnels are useful appliances. Non grooved flooring is worthy of general commendation. Open apertures in the roofs with hinged shutters whereby when occasion requires, warm or heated air may be blown off and a current of wind created from bottom to top through trap doors or other contivances seem practically necessary. No cellars, stables or any damp places ought to be permitted below, for in all such cases the corn will be injured from noxious effluvia arising from under.

Circumstances often direct and guide these and too many other colonial matters. We are not so young as to plead that we have neither had time nor acquired skill to get these matters in working order, for few will deny, that in rural affairs and perhaps civic also, there is indeed great room for considerable improvement. There seems to be a singular peculiarity in the human family for going to work the wrong way. Few men at first march straight a head, like insects or other creatures to the right method. Like Sir H. Davy they must derive knowledge from their failures. Round they run, or turn, or tack, off the true course, until some one perhaps accidentally hits the right nail on the head—and from complexity the perplexity passes to simplicity—and then, however, every body knew or might have known, but strange enough, no one had previously thought of putting the discovery unto practical utility.

After every thrifty plan is tried to store grain in healthy condition, the stack is liable to depredations from various animals or insects. *Sæpe exiguus mus*, says Maro, "often the tiny mouse"

oftener the thievish rats prey on the hoarded stores. These, cats or traps or attractive poison baits may keep down and destroy; but worse than this, than these by far, the *curculio calandra granaria*, or granary weevil almost defies the ingenuity of man to check its multiplications. Weevils belong to the coleopterous family, constituting the *genus curculio* of Linnaeus, and are distinguished from other beetles by elongation of the head forming a long pointed snout. This *calandra granaria*, or true weevil, which we see swarming in vast numbers over walls, roofs of granaries, and amongst heaps of grain, is an insect in its third stage of existence, whose chief business seems confined to the propagation of its species. Much as may be effected by timely turning and screening to preserve grain from depredations of these vermin, they scarcely prove remedial. Cold greatly retards the propagation of these insects and most others. But in a country like the Australias, where the temperature seldom descends much below freezing, and oftener rises to scorching, all European modes nearly are found failures to arrest the multiplication of the grain merchant's greatest foes—the weevil, or more correctly their larvæ. It appears a general mistake, the supposition that the weevil, so well known in granaries, commits all the damage ascribed to stored corn. Doubtless the mature insect constitutes a prime cause. Having arrived at its third or last—its most perfect state of existence for all purposes intended, namely a winged insect, the creature now seeks to fulfil the great end of its present existence by endeavouring to propagate its species, ere ceasing to live. For this purpose, like all other insects in a similar position, their eager impulses are only equalled by their unerring instincts. They eat little, but anxiously endeavour to deposit their ova wherever large collections of grain afford suitable food for the young larvæ as soon as vivified. Now is the time to cut off the parent weevil, as it will not be found practicable completely to destroy their eggs, and far more difficult to kill the larvæ when once entrenched within their castles, each being a single grain of corn. After eating up their garners, or rather the substance thereof, they make holes in the husks or shells, and soon find themselves free denizens of air; as it is doubtfully believed that they pass through the chrysalis state before issuing from their tenements, the fecula and gluten of which had been converted into living insects. Hence the remains of the grain are of no utility for manufacturing flour, and the golden wheat is lost to the community of mankind, little else being left, except the casing, forming at best, when ground at the mills, but a kind of pollard only.

It is not intended, at present, to enter into the natural history of this insect, which your correspondent found it necessary to study. Suffice to say, that for several years he indefatigably pursued a varied train of experiments, in order first, to effect the expulsion, and finally, the destruction of this Curculio. And he is bound to express his obligations to Mr. Fearnley, Lower George-street, for the opportunities afforded of conducting several experiments, and more especially as Mr. Fearnley undeservedly sustained some ridicule on his account. Having at one time set apart one bag of very weevily barley and another of wheat—"all alive, alive O!" at a temperature of about 120 degrees, they were locked up in a closet before two other witnesses, and Mr. Fearnley kept the key. At the end of three days, the door was unlocked and the bags emptied, but all the weevils had fled. Mr. Fearnley published a letter in the *Herald*, stating what he had seen, but as he could give no account how the expulsion was effected; most inquirers, who thought that they would receive valuable information at a cheap rate, then concluded that he had been, in colonial classics, completely humbugged. Like every other puzzle, the enigma will appear plain when explained. Just before locking up, into the mouth of one bag, Mr. Meston deposited a bit of camphor, and into the other, a piece of carbonate of ammonia, both first experiments of the kind, and both successful. These were taken out by him as soon as admission was obtained, leaving Mr. Fearnley and his men in absolute mystification at the wizzard like feat. Chloride of lime is far more effective than hydrate of lime, and chloroform more powerful than either. The expulsive effects of sheep dung, as first suggested by Mr. Robertson, now Honorable Secretary of the Board of Public Works, induced Mr. Meston to try first urine, and then by exposure to atmospheric action, on the high authority of Dr. Ure, urine in a stronger form, by combination with carbonic acid from the ambient air. But all these tended only to expel by driving the vermin from one place only to prey on another. To exterminate became the next aim and object. He found that chlorine destroyed numbers, and also carbonic acid gas—sulphuretted hydrogen had nearly destroyed himself. These gases are quite unmanagable by ordinary men, as well as dangerous; and it was found, that from some peculiarities in their physical construction and organization, many insects will live in vitiated air, or in no air at all, according to our ideas of vitality and respiration.

One experiment leads on to another. A radical method of extermination occurred almost by accident, at once cheap, practicable, and effective. The wonder now arises, that so simple a process should not have been stumbled on before, during five years of groping about in the dark. The loss sustained in this colony by the ravages of weevil must be considerable in amount, and will be more severely felt in importing seasons, and decrease in the milling qualities of weevil eaten grain.

Siloes have never succeeded well, the temperature of the earth is too high, and all the art of man is insufficient to secure them thoroughly, against the inroads of insects and other vermin, or the filtration of rain, or perhaps humidity itself. Rudimentary disease frequently lies concealed in the grain previous to storage.

This then is the result of many experiments, and much anxiety of brain, the secret is wholly my own. It remains for the public to bring it into useful and general application.

R. MESTON.

PROCEEDINGS OF THE PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

The following paper on the Ores of Mercury was read at the twenty-first monthly meeting of the above Society, held in the Chamber of Commerce. His Excellency Sir W. T. Denison, K.C.B., in the Chair.

ON THE ORES OF MERCURY.

BY THE

REV. W. B. CLARKE, M.A., F.G.S., F.R.G.S.

IT will be impossible to treat on the subject to be discussed to-night, without some reference to

my own experience and pursuits in relation to gold, and, therefore, I must commence the remarks which I shall have the honour of addressing to this meeting, by allusion to my researches before the year 1850. Previous to that year, as has been clearly proved by various letters and communications from persons who were acquainted with the facts, which were laid upon the table of the Legislative Council, and afterwards published in the Blue Book by command of the House of Commons, I had acquired such a knowledge of the mode of occurrence of gold in this colony, and of the localities of its existence, as to have been able to inform Sir Roderick Murchison, that it occurred abundantly in the quartziferous schists of the Blue Mountains, and Sir Roderick himself quoted my words from a letter on the subject in his article on gold in the *Quarterly Review*, September, 1850.

As my researches proceeded, I ascertained by experiment, that gold existed invisibly in quartz, and that it could be procured by crushing and amalgamation; and this fact was first made known in Australia in a letter which I communicated to the *Sydney Morning Herald* in 1851. I take therefore, no more credit to myself, than is due, when I claim to be the first person who made known the success of that process to the people of these colonies.

Since that time, notwithstanding opposition and doubts—even in the minds of scientific persons—(for Sir R. Murchison has declared over and over again, that little profit will ever result from gold-mining)—crushing and amalgamation have been gradually obtaining their deserved influence among gold producers; and the facts brought out so clearly, at our last meeting, by Captain Ward, with reference to the gold-crushing machines and the quartz reef at Clunes, have served to establish the high probability that all I have said on the subject of quartz in gold, and gold from quartz by the aid of mercury, will ere long be fully realised; and when the machinery in use at Clunes shall have been brought into operation in this colony, it will be demonstrated, that we have more gold concealed in our vast reefs of quartz than even the speculators themselves imagine. In fact, I do not scruple to assert, that inasmuch as in Victoria, the accidental destruction of the original gold matrices, by geological agents, has produced an enormous amount of gold deposits, *here* in consequence of the less powerful influence of these agents, gold, probably, equal in amount lies yet entangled in the solid receptacles from which machinery and mercury will one day release it.

It may be safely asserted, that a bold assumption of this kind, based on positive evidence, is less presumptuous than the apparently sagacious doubts and questionings of those geological Sadducees, who have yet to learn, that "there are more things in Heaven and Earth than are dreamt of in their philosophy."

Having heard with my own ears, Dr. Lardner declare at a meeting of the British Association, at Liverpool, in 1837, that steamships could not cross the Atlantic from Great Britain to America, because there were no coal depôts on the way, and that within a few months of the establishment of the fact, that a steam vessel had accomplished the voyage; I am not one of those who would despond, because persons of a certain eminence in general science, or of experience in distant countries, are pleased to think, that their own limited observation is sufficient to deny all hope to more bold adventures. Dr. Lardner never dreamed, that Mr. Scott Russell (who maintained the contrary to his opinions at the meeting I have alluded to) would in 20 years afterwards be able to point to the *Leviathan* as an unanswerable example, and I believe that in 1850, there were hundreds of geologists who would have set down as an imaginative myth, or something less polite, the assertion of the prospect of what is now doing at Adelong, and will be done in a dozen other places before 1860.

If, however, we are really interested in the successful result of these undertakings, we shall be equally interested in ascertaining what means are in existence to enable them to be completed; in other words what is the present state of the production of mercury. I propose, then, in this communication to lay before the Society such facts as I have compiled for my own private information, from various sources, as to this production up to the year 1856; not taking any credit to myself, beyond that of careful gleaning and honest quotation.

In accomplishing this, I shall be enabled to give the geological history of mercury, in combination with its commercial statistics, and that in as concise a form as the abundance of my collected materials will allow.

I cannot, however, pass over unnoticed the connection of the subject with *silver* as well as with gold; and as there are some facts and incidents relating to silver, as regards Australia, it may be well to name them.

Hitherto, silver has not been found existing independently in this colony, except in a few localities, and those of, at present, no productive importance. Count Strzelecki reported, that he had seen traces of that metal in the greenstones of the Macquarie River basin. I have also, in my own cabinets two or three undoubted specimens of the ordinary forms of native silver, procured from the gold alluvia, and Mr. Deas Thomson placed in my hands for examination in 1852-3, another. Ores of silver I have not heard of as existing in any available quantity; but of course, it exists in combination with lead and gold, as in every other part of the world where those metals exist. If it be true, that silver is capable of extraction from sea water, the Pacific is large enough and close enough for such as wish to obtain it if in that way it is to be had. But, so far as I know at present, there is more chance of getting it from sea-water, than from some of those localities, which have been reported, during the last few years, as the habitats of silver. One of those was in the Warrambangale Mountains in the Liverpool Plains District, which was examined in 1852 and afterwards, but in vain. *That* was a myth of the dark ages of mineral exploration; and probably was the result of finding some melted solder from a tin-pot at a stockman's fire. I was in like manner, told of *tin* existing in the natural state at the head of the Macleay River; of course, I saw none, but I did find quartz veins in which auriferous pyrites and copper existed. Silver, however, in some cases exists in combination with gold in unusual proportion. In that case like the inferior party in some human alliances, it "rules the roast." When the first sample of gold from the alluvial deposits of Boonoo Boonoo came down, I examined it at Messrs. Flavelle's in George-street, and was very much struck by the occurrence of crystals of gold of a very singular kind; they were heaped on each other in very small crystals in such a way as to give the idea of the common arborescent crystals of native silver. I had never seen such before, nor have I since; and my idea is, that they were pseudomorphs, *i.e.* the silver predominated in such excess as to have influenced the laws of crystallisation. Mr. Graham had sent it

to the Mint before I obtained an answer to a note I sent to Mr. Donaldson (whose I thought it was) —but that gentleman very kindly allowed me to purchase of Messrs. Flavelle another sample belonging to himself, and that, unfortunately, was deficient in what I wanted. Notwithstanding these disappointments, it is to be hoped that *silver* will, one day, emerge from our vast mountainous regions in a more unmistakeable form, and that mercury may find something to do in its production in Australia. It is foreign to my purpose to enter more upon metallurgical questions suggested by the mention of silver; but I may remark, in passing, that in China silver is procured by *fusion*, and not by amalgamation. It is different in other countries, as in Mexico. There, the process of amalgamation, for the production of silver, dates very nearly from the second discovery of America—at least from 1557, just three centuries ago. The discoverer of this art was a poor emigrant miner from Spain, named Bartholemeo Medina, who worked in the silver mines of Pachan. Whatever may be the ingenuity and skill of modern appliances, it is only a just homage to the memory of Medina to state, that to his contrivance, the world is indebted for an enormous amount of gold as well as silver, and that not only from America but from other countries also; and that to him originally, metallurgy is indebted for the invention, of which our more recent processes are merely improvements.

It may, perhaps, stimulate some of our enterprising Australian brethren to undertake a search for mercury, when it is known, that had not processes been invented for the reproduction of mercury employed in amalgamation, by condensation of the vaporised metal, the present production of that metal from all the known sources on the face of the globe would be insufficient for the present demand. In the list of these sources, we cannot, at present, include either Australia or many of the countries on this side of the Pacific.

So far as these colonies are concerned, I believe, the following brief history comprises all that is known of the occurrence of mercury therein.

In the year 1843-4, I procured from the neighbourhood of Mudgee, a small sample of a yellow soil, in which were interspersed several minute globules of quicksilver, which is a rare form of mercury in nature. But, although the yellow colour agrees very well with a similar substance in which mercury is found in some parts of America, I have never satisfied myself as to the undoubted genuineness of the quicksilver. I have sometimes thought it was nothing more than the quicksilver spilt by the breakage of a barometer belonging to a previous explorer; for a similar accident happened to myself, near Wianbene on the head of the Shoalhaven, and some one who found the mercury on the ground, imagined he had made a discovery.

When the Honorable E. Deas Thomson was Colonial Secretary, a gentleman produced to him either in 1850 or 1851, a bottle of quicksilver, which he stated was collected from a waterhole at which he baited his horse, somewhere near Mount Wingan. In 1852, I re-examined that district, with which I was well acquainted many years before, for the especial purpose of tracing the locality alluded to, and I reported to the Government, that I could not find any traces of such a discovery.

In 1850 I had myself, also, received from Tasmania a small bottle of quicksilver said to have been found at the bottom of a well in that island. But in 1856 when I was in Tasmania, I could obtain no information respecting the discovery or of its habitat.

In 1851, the late Governor Sir C. Fitz Roy directed a communication made to the Government by a Commissioner of Crown Lands respecting an alleged discovery of Cinnabar, at Swan Hill, on the Lower Murray River, to be forwarded to me together with the sample by which it had been accompanied; and I was requested to visit Swan Hill to ascertain the value of the discovery. But it occurred to me that I could save the trouble of a journey of several hundred miles, over a country which for a long distance was very unlikely to produce gold, by proving that the alleged Cinnabar was nothing but the artificial preparation known as Corrosive Sublimate. Accordingly, knowing that jewellers employ that substance, I compared the sample with some at Mr. Hale's in George-street; the external characters were alike, and the identity established by him with what he possessed. I then gave a portion to Mr. Porter, the chemist, who reduced the mercury from it, and pronounced it Corrosive Sublimate. A second portion was experimented upon in another way by Captain Gother Mann and myself, at St. Leonard's. The result was, that our experiment ended like the discovery itself, in smoke; but we got nearly salivated by the fumes for our pains. My report to the Government gave some offence to the Commissioner, because I suggested that the sample had been picked up by a shepherd from some spot where sheep had been dressed, and was no discovery at all; but I hope time has removed all unpleasantness from the mind of the gentleman who did not, perhaps, think, that shepherds have a knack of taking people in by their discoveries. Thus a shepherd of Captain Dumaresq, in 1844 picked up a piece of Cheshire salt from the run at St. Aubin's or at St. Helier's, and applied for compensation and reward for his skill and diligence in discovering a mine of rock salt near Scone.

It is to be hoped, for that is the reason why I have made this digression, that as by intuition gold was found in 1851, where it had only been found a year or two before by parties whose imaginations led them to draw up a guide paper to the identical spots alleging the year before that the gold had been found there long ago—so by intuition some astonishing genius will ere long, descend from the planet Mercury itself and re-discover the quicksilver which like truth lies at the bottom of a well, and point out the waterhole, where horses may quench their thirst and their gold-amalgamating riders may bottle quicksilver for home consumption, at the same time.

As it is not without an object that I introduce these *επεα πτερεοντα*, I must crave permission of the Society to relate another little anecdote, by way of illustrating the wonders of discovery, in this unsophisticated part of the Universe.

One evening in 1842, at Government House, Paramatta, Lady Gipps showed me a mineral which she said had been reported to have been seen by Captain Sturt falling from the sky in the interior,—in short it had been given to her ladyship as an *aerolite*. I told her, that it was nothing but a specimen of the brown radiated iron pyrites so common in the chalk of England, and of which cart-loads might be procured at the back of her father's residence in Kent. A few nights after, the same stone was shown to Mr. Dunlop, the late astronomer at Paramatta, and the same story was repeated about the sky, and it was added,

that I had condemned it to the condition of a mere earthly production, as a lump of pyrites. To this Mr. Dunlop replied, "*very true, Captain Sturt may have seen it fall from the sky—but either he or a blackfellow threw it up first.*"

Now, the moral of this remains. People who discover gold by intuition may, perchance, have found it where it had been discovered before. And people who find quicksilver at the bottom of wells and out of the way water-holes, may have found only what somebody put there before them. I only hope that discoveries of mercury in the colony will be made, hereafter, without the aid of guide-papers, or the blackfellow's prescription of throwing up things into the air in order that they may fall down again.

Quitting, then, the scene of Australian discoveries I repeat, that hitherto no mercury has been produced from the greater part of the western side of the Pacific. None has been discovered in any of the multitudinous islands of that ocean. None, moreover, has come from Asiatic Russia or Siberia; none in any available quantity from Africa; none from any part of Asia except China, and even the produce of China itself, though the existence of its ores in that country is well known, compared with other countries, is very inconsiderable. This is, to say the least, a remarkable fact, and ought to set our discoverers to work, if they wish to create a sensation in the minds of gold amalgamators.

It is an almost equally remarkable fact, though of another kind, that notwithstanding the known want of this metal in other countries, China has never exported it. The produce of China is therein expended.

Spain in the 17th century vainly tried to create a trade in mercury, wanting it for her Peruvian and Mexican establishments. She only succeeded in obtaining a very small amount in 1609, but the trade dropped in consequence of the roguery and trickery of the Chinese merchants.

In the days of Lord Anson, they sold dead pigs to the British Admiral, which by sewing them neatly up again, after they were disembowelled, having filled them with water, they managed to make heavier than before; so they sold to the Spaniards mercury mixed with lead, metals of different sp. gr. of course, but still, by the trick, getting a double advantage. In 1781, another attempt was made to revive the trade, which for similar reasons was soon re-abandoned. Now, there has been a question agitated of late respecting the Chinese, as to their addiction to smuggling; and the Government and Legislature have taken a very charitable view of the offences charged against our pig-tailed celestials.

We will now turn to Europe.

So late as 1830, all the mercury employed throughout the globe, (with the exception of China) was the produce of Europe. It is only from that time, that we must date its discovery in California. At present, Spain and Idria (a province of Austria) are the only countries in Europe from which it is received.

The mercury of Spain comes chiefly from Almaden in Andalusia, on the borders of Estramadura. These mines were worked in the days of the old Romans. The Cinnabar is nearly half pure mercury, and the supply has been constantly monopolised by the Spanish Government.

The profit is so great, that in 1790, when the price was considerably lowered, it amounted to £120,000 sterling. The Rothschilds farmed these mines in 1855, at a rent of £250,000, and in that year the supply was about 2000 tons.

The mines of Idria have also a great antiquity. They date so far back as 1497. When Napolean conquered Venice, they were allotted to Austria, under whose management the supply was increased 65 per cent. between 1823 and 1848. The greater part of the ores is Cinnabar. In Hungary, the produce is inconsiderable; in Travsylvania, about four times greater; and in each territory, it is procured in the search for other metals. The mines of Idria have often furnished scenes for novellists and romancers, and the author of the poem called "The Mine" was indebted to two letters in the *tenth* volume of the "Annual Register" by Mr. Everard. (See Polehampton ii. p. 332.)

Of the other countries of Europe, Rhenish Bavaria furnishes about 5 tons annually. In 1830, there was a notice of a discovery of mercury in Tuscany. Portugal has also been mentioned, and it was said in 1853, that the city of Oporto was the site of a rich mine, which the Corporation would not allow to be worked. European Turkey has been also named, but none has been produced from it; but in 1851, Corsica was reported as possessing a deposit yielding 80 per cent. of mercury.

We go now to America. In that continent are numerous valuable localities. Almaden furnished many exports of the metal to the countries of Spanish America; and these for a time were much assisted by discoveries of ores at Huancavelica in Peru, but in 1780 after the mines of the latter place had fallen in through the mismanagement of the directors, who cut away the pillars that supported the roof to get at the mercury in those masses, Austria agreed to a cnovention with Spain and supplied nearly 600 tons, by which she profited about 23 per cent., by selling the metal at 2s. 6d. per lb. Since 1800 Spain has not required any aid from Austria, and although she at that time lost her mines in Peru and Mexico, yet the supply increased to her once American possessions. It is only astonishing that the mines indicated by Humboldt have not been wrought; he tells us that so common were the ores, that the antient Mexicans and Peruvians used them as pigments to ornament their bodies. According to him few countries are so rich in mercury as Mexico, Peru, and New Grenada, and it may be found every where in Guanaxuato. Some private individuals had worked to a trifling extent in 1800. The Incas procured it from Mount Palkass, but in 1570, the right was reserved by the Government. In 1795, the Indians were permitted to search for it, and they have been so successful, that in 1855, the quantity realized in this way was about 300 tons. The discoveries made in California, in 1848, caused a great competition in exploration amongst the Peruvians, and in 1852, mercury was discoverd close to the mines of Potosi. But I have obtained no reliable information as to the workings, and the notices respecting California are more available. From 1847, when that State was annexed to the Union, a great search was made for mercury. It was not long before it was discovered on the Sierra Azul, between San Francisco and Monterey, a few miles from the coast. The locality was called New Almaden; the mercury was found a few feet below the surface and about 1200 feet about the plains and rather more above the sea; the range runs N.W. and is chiefly of greenish talcose rock. But the matrix is a yellowish ochreous substance about 42 feet thick dipping N.W. at an angle of 40°. The upper part is the richest. The aboriginals appear to have long known its existence; the cave whence they procured the red earth to paint their bodies was first found to contain quicksilver in 1844, when some Mexicans entered

it to look for gold. This is interesting, because the gold at Sutter's was not found till four years afterwards. In 1846, the house of Baron Forbes, and Co., (called by Ughios and Otrescskoff, Beron Fobresse and Co.) obtained the right to work the mine, but the vessel in which they sailed from Mexico, fell into the hands of the U. S. Navy, and was confiscated. It was only in the beginning of 1848, as I learn from a letter of the Rev. S. Lyman, (A. J. VI. 270), that the workings commenced. The first apparatus was rude enough. Potash kettles and the commonest contrivances sufficed, but occasioned considerable loss of the metal. The produce was about 50 per cent. In that way the profit was 100,000 dollars per annum. Besides this 10 or 15 other mines were known so early as March 1848.

(To be continued.)

METEOROLOGICAL OBERVATIONS IN AUSTRALIA,

BEING A CONTINUATION OF THOSE PUBLISHED IN WAUGH'S AUSTRALIAN ALMANAC FOR 1859.

By W. S. JEVONS,

(Lately) Assayer in the Sydney Branch of the Royal Mint.

[We have been kindly favoured by Mr. Jevons with a quantity of valuable data on the climate of this continent which he originally intended to publish, together with those that appear in the Australian Almanac for this year, but from which publication they were excluded for want of space. They will, however, be completed in the pages of this *Magazine* and will form an important addition to the physical history of the country. We much regret to learn that Australia is about to lose this laborious and unassuming yet most promising natural philosopher. We fear it will be long ere we shall find another observer so industrious, so talented, and so modest.—*Editor of the Sydney Magazine of Science and Art.*]

ON THE HOTWINDS OF AUSTRALIA.

I will undertake to describe briefly, what is commonly felt and seen during a well marked hot-wind, in the neighbourhood of Sydney.

A few days of delightful weather, with moderate, but refreshing breezes from the North-east during each afternoon, will probably be followed by a day which is felt to be rather too sunny and fine. There *was* a little scattered cloud before, there *is* none now; the breeze is strong, and warm, and from the north; an unusual dryness is already felt; and the fall of the barometer which was very slowly proceeding for some days previously, is now greatly accelerated. The sun sets colourless, and a hotwind may certainly be expected. The night, however, is calm and cool.

On the next morning, the heat soon becomes oppressive, even while the air is still. If floating scraps of cloud be closely watched, however, they will be seen hurrying across the sky, proving that a violent current of air from a north-westerly point of the compass, has already for some time prevailed in the loftier regions of the atmosphere. A few hours before noon, this wind is felt at the surface perhaps commencing with a sudden gust. Gust after gust succeeds, and the full effects of a hot wind soon appear. A room that before was warm and close, now seems the only cool retreat and every window and door is quickly closed to exclude the hot and parching breath of air. But it can scarcely be excluded, for the furniture creaking loudly, the leaf of a book curling up and feeling crisp, and ink drying as it leaves the pen, are all proofs of a dessicated atmosphere even within the room.

On leaving the house, in the midst of a hotwind, the first sensation has not seemed to me disagreable; this heat is great, and the imperceptible perspiration immense, but the body feels only a glowing warmth almost like that which succeeds a hot bath. The skin is not moist even after violent exercise, but if the person then enter a closed room, the perspiration will suddenly start from every pore in liquid drops, and coolness thus almost seems the reverse of refreshing. Out-door work is seldom interrupted by the severest heat any more than indoor works. But the vegetable kingdom does not pass so scatheless; at the close of such a day, every delicate leaf droops and is slightly withered. From a high point an observer is sure to see rising columns of smoke obscuring the sky, and pointing out where bush fires rage.

Clouds generally appear, but in a very lofty position. They are composed of very flat cumuli, which possess a well defined outline and a peculiar appearance which I cannot describe.

It must be a severe hot wind if it occur again the next day; in that case the intervening night is quite calm and cool, and affords temporary relief. The open sky is now preferable to all shelter.

Towards the end of the second or at longest the third day, invariably follows the well-known "brickfielder," or "southerly buster" in colonial phrase. Sometime, usually between 1 p.m. and 9 p.m., the barometer which is now perhaps as low as 29·5 inches, shows a sudden rise, the observer should then look out towards the southern horizon, and he will probably see, a faint low, blackish line of haze. This gradually increases in height, large cumuli sometimes appear above it, with loose scraps forming continually beneath but rising with a rapid agitated movement. The nature of this phenomenan is not long in doubt; it is soon within a mile and its approach may be timed by a watch. It is a sudden squall of wind which bears in front a whirling cloud of dust; wherever the town extends, there will instantly extend far above the tops of the house this envelope of impalpable red powder derived from the pulverised ironstone of the streets. The temperature falls perhaps 20 degrees in the first half hour; those who will enjoy this coolness, must suffer in the eyes and clothes from dust. In doors the air now appears insupportably hot and sickly, and the dust insinuates itself through every crevice. A gale or heavy wind follows from a nearly due south point; after a few hours, scud-like clouds form and fly over, and a black sky, and a fall of rain is often the consequence.

It cannot be said that everything I have described above happens on any one occasion, but I have embodied in one imaginary case all the most remarkable phenomena, which *may* occur, and I have employed no exaggeration. I will now give in the form of a table, actual observations during a very severe hot wind, November 9th-11th, 1855.

OBSERVATIONS DURING A HOTWIND.

Day and Hour. Nov. 1855.	Corrected height of Barometer.	Temperature of Air.	Dew Point.	Sun Thermometer.	Wind.	Remarks.
8th, 9 a.m.	29·793	68·8	49·7	100		
9 p.m.	"·663	63·4	55·7		N.E.	Cirrostratose cloud.
9th, 9 a.m.	"·383	76·9	62·6	114	N.E.	Max. temp. of day 98°0.
0·30 p.m.					W.N.W.	Gusty and intensely hot wind. Some low tufts of cirrus moving quickly from W.N.W.
3· p.m.	"·345	95·9	47·4	129		Cirrus. Bright yellow sunset. Greenish sky.
6·30 p.m.	"·440	82·9	45·0	81		Cloudless. Min. temp. 50·8.
9 p.m.	"·512	75·1	44·1			Calm night.
10th, 9 a.m.	"·463	85·8	47.7	117	W.N.W.	Cirrostratus and Cumulus. Hazy atmosphere. Max. temp. of day 96·8. Strong hot gusty wind.
9 p.m.	"·470	78·9	43·3			Calm night. Min. temp. 51·9.
11th, 6 a.m.	"·588	55·0	46·0	65		Cool still air. Clear sky.
9 a.m.	"·533	76·0	42·5	110	W.N.W.	
noon.	"·381	84·9	42·7	124		Max. temp. of day, 87·0.
3 p.m.	"·295	85·4	46·2	106		
6 p.m.	"·294	79·1	43.1	80	W.N.W.	Cumulus.
7·30 p.m.					S.W.	Sudden and tremendous squall.
9 p.m.	"·484	60·5	39·7			
12th, 9 a.m.	"·615	65·5	36·4	104		

This hot wind it will be seen lasted from noon of the 9th until 7·30 p.m. of the 11th. The temperature varied on the 9th, from 50·7 to 98 degrees, showing the great range of nearly 50 degrees. The dew-point gradually sank from 62·6 to 36·4 degrees, indicating that the quantity of moisture in the air was reduced in the proportion of 10 to 4. It is also very remarkable that the barometer rose and fell each day about ·2 of an inch, the regular daily oscillation being greatly multiplied.

TEMPERATURE OF THE SURFACE OF THE EARTH.

The temperature of the surface of the ground, seems to me an element of much importance since it is by contact with this hot or cold surface that the atmosphere solely acquires or parts with its warmth. And since the degree of heat which the earth may acquire under the sun's rays, to a great extent regulates the evaporation of any moisture it may contain, and affects the vegetables growing in it.

My experiments were made by placing a thermometer only just so deep in the earth that its bulb shall be covered from sight. It was read at 9 a.m. and 9 p.m., simultaneously with the thermometer exposed to the air in the shade. The following are the average results of one year, 1856:—

AVERAGE MONTHLY TEMPERATURE OF THE SURFACE OF THE EARTH.

Month.	Temperature of Surface of Earth.	Difference from Temperature of Air.	Month.	Temperature of Surface of Earth.	Difference from Temperature of Air.
January.....	77·0	7·8	July.....	43·7	—1·8
February....	75·3	6·1	August.....	50·8	— ·7
March.....	72·4	4·4	September..	62·7	6·9
April.....	64·0	·8	October	70·8	8·4
May	52·7	—1·0	November ..	70·7	7·4
June	45·8	—1·9	December ...	76·6	10·4

N.B.—The mark (—) means that the earth is so much colder than the air.

Mean annual temperature of surface of earth ..... 63·5 degrees.

Mean annual excess above temperature of air..... 3·9 degrees.

In the interior of Australia, this excess would doubtless be immensely increased. Many remarks of Mitchell, Sturt, and Eyre, show that the earthly plains become so thoroughly and deeply heated, as to retain their warmth all through the night. The Australian land-surface must therefore have a great influence in heating the superincumbent atmosphere.

The following table, formed from 22 series of hourly observations shows the effect of the sun's rays in heating the earth, and of the clear night sky in cooling it:—

HOURLY VARIATION OF THE TEMPERATURE OF THE SURFACE.

Hour of the Day.	Difference of temp. of earth and air.	Hour of the Day.	Difference of temp. of earth and air.	Hour of the Day.	Difference of temp. of earth and air.
a.m. 6	—3·2	p.m. 2	19·3	p.m. 10	—3·0
„ 7	—3·0	„ 3	12·6	„ 11	—3·1
„ 8	1·3	„ 4	6·5	„ 12	—3·2
„ 9	5·4	„ 5	1·6	a.m. 1	—3·0
„ 10	11·5	„ 6	— ·7	„ 2	—3·0
„ 11	16·4	„ 7	—2·4	„ 3	—3·3
noon 12	20·1	„ 8	—3·0	„ 4	—3·3
p.m. 1	20·0	„ 9	—2·9	„ 5	—3·2

Except when heated by the sun's rays or when the sky is covered by clouds, it is seen that the ground is cooler than the air by about 3 degrees. About the summer solstice and in the middle of the day, the surface of the ground often reaches a temperature of 130 or 140 degrees. On December 12th, 1855, at 1 p.m. the temperature of the surface was 146 degrees.

HUMIDITY OF THE AIR.

As this is not a subject of evident or popular interest, and is one of much scientific complication and difficulty, I shall limit my data to little more than a complete table of numerical results.

HYGROMETRICAL TABLE FOR SYDNEY,

FROM OBSERVATIONS AT 9 A.M. AND 9 P.M., DURING THREE YEARS, JULY 1855 TO JUNE, 1858.

Month.	Mean Temperature of Air at 9 a.m. and 9 p.m.	Temp. of Evaporation.		Dewpoint of Air.				Mean Tension of Aqueous Vapour.	Weight of Vapour in grains.		Degree of Relative *Humidity.	Weight of a Cubic Foot of Air.
		Mean at 9 a.m. and 9 p.m.	Difference below Temperature of Air.	Mean Dewpoint.	Highest which has occurred.	Lowest which has occurred.	Average Range during Month.	Inches.	Contained in 1 cubic foot.	Deficiency.		Grains.
January	71·3	65·9	5·4	61·8	71·2	44·2	21·3	·553	6·1	2·3	72	521
February	70·0	65·4	4·6	61·9	75·2	45·8	22·3	·555	6·1	1·9	75	523
March	68·2	64·7	3·5	61·9	72·2	41·2	20·8	·554	6·1	1·5	80	526
April.....	62·8	60·0	2·8	57·6	67·9	40·1	20·9	·475	5·2	1·1	83	533
May	54·5	51·9	2·6	49·4	61·9	35·8	22·3	·353	4·0	·8	82	542
June	49·8	47·0	2·8	44·0	60·0	30·4	22·3	·288	3·3	·8	81	546
July	48·0	45·8	2·2	43·5	55·5	31·6	18·0	·284	3·2	·6	85	550
August.....	50·6	47·5	3·1	44·3	58·6	32·4	20·6	·292	3·3	1·0	79	546
September ..	55·8	51·5	4·3	47·4	61·7	34·2	25·1	·328	3·7	1·3	74	539
October.....	61·0	56·1	4·9	51·9	64·7	39·7	22·3	·387	4·3	1·7	72	533
November ..	65·2	59·5	5·7	55·0	65·4	40·0	23·3	·433	4·7	2·1	70	527
December....	67·6	62·7	4·9	58·8	70·0	43·0	20·6	·497	5·5	2·0	74	525
Means.	60·4	56·5	3·9	53·1	75·2 Highest	30·4 Lowest	21·6	·417	4·6	1·4	77·3	534·3

* Some of these numbers differ by a unit from those published in the *Sydney Magazine of Science and Art*, Vol. II., p. 38. There is a slight difference in the mode of calculation.

The dampness of the air is expressed by the number 77·3. In London this number would be about 82, and consequently in the proportion of 77·3 to 82 is the air in Sydney less damp than in England.

From observations during eight years in Hobart Town, the mean elastic force of aqueous vapour has been determined to be ·302 inch; the mean degree of humidity is 76, so that the air is slightly drier in Tasmania than on the east coast of Australia.

From Dr. Pugh's observations at Launceston, using only the readings at 9 a.m., I find the mean dewpoint to be 46·7, the elastic force of vapour ·319, and the degree of humidity 76.

It is still more curious, however, that at Hobart Town in winter the humidity of the air is greater, and in summer considerably less than in Sydney, as the following numbers show:—

	Relative Humidity.		Relative Humidity.		Relative Humidity.
January.....	66	May.....	82	September.....	77
February.....	71	June.....	86	October.....	73
March.....	71	July	88	November.....	70
April.....	77	August.....	83	December.....	65

This may be accounted for by the essential difference of the climate of the southern and eastern coasts.

In the following table, I compare together the hourly variation of the elastic force of aqueous vapour in Sydney and Hobart Town; the numbers denote the departure from the mean of the whole 24 hours:—

Hour.	Sydney.	Hobart Town.	Hour.	Sydney.	Hobart Town.
a.m. 6	—·030	—·013	p.m. 6	·013	·003
„ 7	—·020	—·008	„ 7	·002	·002
„ 8	—·007	—·002	„ 8	—·001	·000
„ 9	·007	·004	„ 9	·001	—·001
„ 10	·022	·008	„ 10	—·008	—·004
„ 11	·029	·013	„ 11	—·011	—·006
noon 12	·038	·017	„ 12	—·015	—·008
p.m. 1	·028	·018	a.m. 1	—·022	—·011
„ 2	·022	·017	„ 2	—·024	—·013
„ 3	·022	·016	„ 3	—·026	—·015
„ 4	·020	·012	„ 4	—·027	—·018
„ 5	·022	·007	„ 5	—·029	—·016

The elastic force is in excess of the mean, except where the mark(—)is placed.

It will be seen that the hourly variation is greater in Sydney than Hobart Town.

Amount of Cloud.—The amount of cloud in the atmosphere, is estimated by supposing the sky divided into ten equal parts, and recording how many are coverved by clouds, as nearly as can be guessed. The following are the average results of such observations at 9 a.m. and 9 p.m. eh d ay for three years.

Month.	Decimal part of the sky covered.	Month.	Decimal part of the sky covered.
January	·564	July	·397
February	·586	August	·301
March.....	·514	September	·379
April	·486	October	·532
May	·412	November	·506
June	·389	December	·615

Summer.....	·588	Spring	·472
Winter.....	·362	Autumn.....	·471

The averages of the three separate years, and of the three together are below.

	1855-6	1856-7	1857-8	1855-8.
June to July.....	·494	·467	·458	·473.

The mean extent of cloud in Sydney, therefore almost exactly covers one half of the sky.

THE THUNDER AND HAIL STORMS OF AUSTRALIA.

Thunder clouds may be distinguished into two or more kinds. It is highly remarkable, that all the large and serious kind of thunderstorms along the whole eastern coast, from Moreton Bay to Hobart Town at least, proceed from a point of the compass between north and S.W., and generally from the N.W. The same happens also on the western side of the dividing range. North of Moreton Bay, Dr. Leichhardt found them to proceed from the west and S.W. It cannot escape notice that these are precisely the directions from which the hottest and driest winds proceed, and it is also a fact that the barometer falls previously to a thunder or hail shower just as it would for a hotwind. Here is apparently a paradox. I have already described a hotwind, I will now describe the usual accompaniments of a severe thunderstorm at Sydney.

After sea breezes have prevailed for several days, the air will, perhaps, be observed on some clear sunny and nearly calm morning, to have a moist warm, or sultry feeling. If the barometer be at the same time quickly falling, a thunderstorm may certainly be expected in the afternoon. The first sign of this is the *cirrostratus* or feather-cloud spreading from behind a confused bank of cloud on the western horizon. Soon it will be seen extending itself towards the zenith, producing a thin streaked or hazy sheet of cloud, often of a distinctly arch-like form. If closely observed it will be detected moving rapidly in the same direction as the fibres or streaks point, viz., from the west to the east, consequently in opposition to the light easterly wind which is probably felt at the surface of the earth. When the cirrostratus has so much increased, and to cover nearly the whole sky with a leaden coloured veil-like cloud, dense heavy masses will be seen in the west, chiefly enveloped in the cirrostratus, but showing here and there the rounded, well-defined outline of the cumulus, and a black, broken but somewhat level under surface. From this body of cloud, the rain, hail, and lightening proceed; beneath it squalls of wind are usually felt. When it has passed to the eastward a mere tailing of cloud is left behind, unless loose disconnected clouds are produced by other causes. A change of wind to the south usually follows, and the barometer rises.

According to the theory which I have already published, *(Sydney Mag., vol.* I., *London Phil. Mag.)*, the thundercloud consists of a great body of air rushing upwards in the atmosphere. The moist sultry air from the surface is what supplies or feeds this upward current, and it can be clearly shown, that under such circumstances most of the invisible vapour which the air contains, would be condensed into particles of water. So long as these particles are sustained in the air, just as a sediment in water, a dense white and opaque cloud is produced which forms the body of the thunder-

cloud. But when the watery particles become so large as to force their way downward and fall as rain, the sustaining air is *permanently freed of their weight* and rising yet higher, gradually mixes with and filters into the higher strata of the atmosphere, producing the hazy spreading cirrostratose cloud which I have described. Hail is produced (as was sometime since explained by Mr. Espy, an American) when the upward current is so rapid as to reduce the temperature of the rising air to the freezing point, and at the same time to sustain the hailstones until they are increased by successive additions, to cover an extent of surface sometimes, of several miles in diameter.

In the case of the east coast of Australia, I believe, that the *occasion* of the great thunderstorms, is a strong westerly current blowing in opposition to a sea-breeze, which has caused an accumulation of warm moist air over the land. At the point of conflict of the two currents, the weaker easterly one is turned upwards its moisture is converted into hail and rain, its electricity is collected and discharged by flashes of lightning, and the desiccated, de-electrized air is borne away by the vanquishing current in the form of cirrostratose cloud. This theory fulfils, I think, every condition and explains almost every appearance, with the exception that the westerly predominating current is seldom felt at the surface in Sydney. It may, however, be felt in the interior, and I find the required confirmation in the following statement of Mr. Meston's. "After a thunderstorm it is two to one that a hard north-wester follows before the æreal balances are adjusted." (Waugh's Australian Almanac, 1858, p. 51.) The paradox of thundershowers and dry hotwinds proceeding from the same point of the compass is now explained. A depression of the barometer and a disturbing westerly wind are the occasion of both, but it is the east or sea wind which in the case of thunderstorm supplies the rain and electricity. In other countries where thunderstorms, but no hotwinds are known, it is only necessary to search for some other *disturbing cause*, in place of the hotwind.

I stated in the outset, that there were two or more kinds of thunderstorms, the major kind being alone referred to as yet. The minor kind consists of a simple cumulus generally of huge size and columnar form floating across the sky in the same direction with the wind at the surface. Heavy rain or even hail may fall from it, but the lightning appears nearly harmless. The electrical discharge is chiefly internal, and at night illumines the massive, well defined cloud in the most beautiful manner. On one occasion (January 14th, 1858, see Met. report in *Empire* newspaper,) a cloud of this nature produced sparks of lightning darting into the air, running along the surface of the cloud, branching into many forks, or exhibiting a variety of other beautiful forms.

As a practical rule, persons in considering the weather or observing the approach of a storm, should notice not so much the wind at the surface as the direction in which the clouds are moving. This may be done by looking steadily upwards for a few moments, or more distinctly by bringing the cloud visually against some fixed edge or point. A more correct judgment may thus be formed as to the point of the compass from which a storm or bad weather will come if at all.

Those who may be acquainted with Arago's peculiar but excellent essay on thunder and lightning will appreciate the value of a collection of facts apparently the most trivial for the gradual elicitation of truth in obscure subjects. With such a view I have formed a list of the severe thunderstorms which have occurred in New South Wales since its first settlement, noting any peculiarities or casualties. I give only those which are really severe and it is of course certain that many severe ones have either escaped my notice or have not been recorded. Thunder and lightning, hail, rain and wind, squalls, &c., are generally but simultaneous effects of the same atmospheric disturbance; I mark by the respective letters th., li., r., sq., hl., (indicating thereby thunder, lightning, rain, squalls, hail) the most prominent features of each storm.

CHIEF THUNDERSTORMS OF NEW SOUTH WALES.

1788.—February 6.—Several sheep and other stock killed by li. in Sydney.

1795.————Sydney. "A dreadful shower of hail or rather flakes of ice fell, occasioning serious damage to the growing crops, as well as to the cattle."

1798.—May 14.—Hailstones 6 inches in diameter.

1804.—December 10.—Th., li., r., from N.W. Fearful lightning, hurting 2 men.

1805.—November 18.—Awful thunderstorm. Several cavities produced by lightning in a garden in Farm Cove. December 4.—Th. Sydney and Parramatta.

1806.—September 7.—Hl. Hawkesbury. November 25.—2 men killed in Sydney Cove by lighting.

1810.—January 6.—Th. Sydney *Gazette* Office struck by li. September 28.—Hl. Sydney.

1812.—January 18.—Great hailstorm at ten miles distance from Sydney, some of the stones 8 inches in circumference. November 7.—Fearful hailstorm at George's River, after which the ice lay 6 inches thick on the ground. 26 hours after the storm, some stones measured 4 inches round. One person had 110 head of poultry killed. 90 acres of wheat in one place were destroyed.

1814.—February or April.—Fearful hailstorm in Sydney. It set in from the southward about 2 p.m. and lasted only 12 minutes.

1818.—October 29.—Thunderstorm.

1820.—November 4.—During a tremendous thunderstorm (9-10 a.m.) the Government House at Parramatta was struck by lightning, which passed from top to bottom and reduced it almost to a wreck. Several hundred panes of glass broken, and suffocating sulphury smell produced. The Governor was fortunately absent, since the walls of his office were perforated and his chair struck Mrs. Macquarie escaped uninjured, although in the house. December 11.—Mr. Oxley's house at Kirkham, struck by lightning in the form of a pillar of fire. One man killed.

1821.—October 4. Four cows killed by one flash of li. at Bringelly.

1823.—January 18.—Th. Liverpool. A gang of men in irons struck while sheltering in the church. February 17.—Fearful thunderstorm in Sydney. Lightning struck the ground in at least four or five places, killing one man and doing much damage. The Asylum struck. The mainmast of the "Brixton" was shivered, and it is curious that she was lying in the very spot where two other vessels had been previously struck by lightning.

1824.—May 10.—A furious storm of thunder, lightning, and hail passed over Prospect and Pennant Hills. Ice, collected in low parts at Prospect, to the depth of 10 feet. Many pigs and poultry were killed, and corn, potato, and tobacco crops destroyed. Shingles on the roofs of houses were split, and the hailstones cutting through the barks of trees, sometimes grazed the wood beneath.

In some places overshadowed by trees, the road was strewed with broken branches. The falling of the largest flakes was very partial and singular. They fell in a kind of narrow stream; sometimes it went forward in a direct line; and occasionally curved like a half-moon, so that some farms appeared to escape miraculously, while others alongside and in the same direction were greatly damaged. The hail assumed various shapes, some being oblong, others globular, and semiglobular, while great quantities were triangular. A man at Pennant Hills, measured a hailstone 12 inches in circumference. Often they were some six times as large as hailstones which fell 18 years back, (1836), and which were described as the size of an egg.

1827.—November 19.—Heavy thunderstorm and squall at midnight.

1829.—January 11.—A most violent hurricane and hailstorm. August 1, hl. October 19? hl., Sydney, weather-cock on Parramatta Church steeple struck to the ground.

1830.—October 27.—Hl., Sydney.

1831.—December 30.—Th. h., Namoi River.

1834.—January 11.—Th. December 15.—Th., Windsor.

1838.—February——Awful thunderstorm at Yass. Windmill struck.

1839.—November 7.—Th.

1840.—May 10.—Th. r,, Port Macquarie.

1841.—November 21.—Th. Prospect. December 20?—Terrible hailstorm, Jerry's Plains.

1842.—February 11.—Th. r. A young girl killed by lightning, when standing under a tree at Maitland. September 28.—Violent hail, rain, and thunder. Mill in Sussex-street struck. October 27.—Hailstone of 2¾ inch diameter.

1843.—December 16.—Terrific thunderstorm.

1844.—January 14.—Storm of lightning, hail, rain, &c., gyrating from N.W. to S.W. Hailstones of the size of pullets eggs, and of an angular shape. For one elaborate description of this storm, see Rev. Mr. Clarke's letter in "*Australian*," January 23, 1844. September 6.—Th. Singleton.

1845.—December 9.—Hl. w., Buree.

1846.—February 18.—Th., Sydney.

1847.—April 13.—Ketch 'Ebenezer,' off Whittell's Wharf, was struck by lightning. Several persons injured.

1850.—January 2.—Th. February 17.—Th. January 27.—Hail and thunderstorm, Windsor. October 4.—Hl., Hunter River. October 13 and 14.—Moreton Bay, hailstorms with lightning on both days; most heavy on 14th when pieces of ice fell, some weighing 1½ lb., and many 3 or 4 oz. Several pieces measured 7 inches in circumference. October 15.—Th. hl., one woman killed in Sydney. November 11.—H., Bathurst hailstones, 7 inches in circumference. November 23 (?)—Bathurst, thick constant shower of large hail at Bathurst, for half an hour. This storm described a path two miles broad, at least forty miles long. December 16.—Th. hl., Bathurst. December 21-22.—Thunderstorm at Parramatta, Windsor, &c. See a description, with general remarks upon the season by Rev. W. B. Clarke, in *Sydney Herald* of December 28th, 1850. It is there stated that 1 inch of rain fell in 21 minutes, or at the rate of 70 inches in the 24 hours.

1851.—January 3.—Th., Goulburn. January 15.—Th., Windsor. January 19.—Th., Bathurst. October 21.—Th. hl. squall, Windsor. December 18.—Th., Turon River. December 30.—Great thunderstorm at Richmond. A young woman killed when standing in the doorway of a room; persons inside were only stunned.

1852.—April 8-13.—Th., Port Macquarie. September 8.—Th., Turon. September 29.—Th., Maitland.

1853.—November 19.—Th. Bathurst.

1856.—February 6.—Th. r., a flock of 200 sheep killed, at Yankalilla. September 28.—Th. r., the Ovens. October 14.—Th., hl. r., w., Newcastle. November 19.—It is a remarkable and interesting fact that on this day hailstorms of extraordinary violence, though of small extent individually, occurred almost simultaneously in parts of N. S. W. as far separated as the following:—

Yass, at	9·30 a.m.	Wollongong, at	
Richlands, at	10· 0 a.m.	Upper Paterson, at	3·0 p.m.
Wheeo		Sydney	11·0 a.m.
Bathurst, at	0·30 p.m.		

At Sydney, indeed, there was no hail but only a slight thunderstorm moving with great rapidity from the west. In other parts of the colony the accounts of the hail are extraordinary, and very closely coincide. The showers usually lasted 20 minutes, the stones being of the size of pullet's eggs, or sometimes measuring as much as 2 inches in diameter. One stone which fell near Bathurst weighed 8 ozs. The usual disastrous effects were produced upon all glass windows, all gardens, vineyards, wheat crops which lay beneath the path of the hail-clouds. November 26.—Th., Sydney, Windsor, Goulburn. Two houses struck in Sydney; several accidents and one child killed at Windsor. November 30.—Th., Drayton, Brisbane. December 10.—Sydney, hailstones of ½ inch diameter. December 26.—Th., Sydney. Four children struck at Ultimo; one who was elevated on a rock some 8 feet above the others was killed, his felt hat being rent open, and acquiring a smell of brimstone.

1858.—March 11.—Th. h. r., Armidale. On the Bogan a stroke of lightning penetrated the bark roof of a verandah, leaving a small hole, and killed and disfigured a man standing beneath.

The preceding list includes 71 severe storms, omitting 2 which are without date. The following is their monthly distribution:—

	Hail.	Thunder and hail.		Hail.	Thunder and hail.
September	0	7	March	1	1
October	7	11	April	0	2
November	4	13	May	2	3
December	5	13	June	1	1
January	3	10	July	0	0
February	0	7	August	1	1

Great thunderstorms and hailstorms therefore, occur almost entirely during the spring and summer, the hottest and driest part of the year. They are independent therefore of the heaviest rains which predominate as I have proved in the autumn months. It cannot escape remark, too, that thunderstorms occur in the same months as hot winds.

At Hobart Town "thunder and lightning are not frequent, but occur occasionally after a hot wind with the usual heavy rain attendant upon thunderstorms. They always approach from leeward. (Com. Kay, Trans. V. D. L. Royal Society, 1851, 149.

(To be Continued.)

METEOROLOGICAL TABLE.

DECEMBER, 1858.

OBSERVATORY, SYDNEY, LATITUDE 33·52 SOUTH; LONGITUDE, 151·12 EAST
HEIGHT ABOVE THE SEA, 145 FEET.

Day.	Barometer corrected to 32 deg. Fenht.		Wind. Direction.		Force.		Temperature Max.	Temperature Min.	Cloud Extent.		Rain in Inches.	Remarks.
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M.	9	9		
1	29·539	29·722	W.S.W.	0	1	0	80·8	63·4	0	0	·091	Several thunder showers
2	·825	·825	S.W.	E.	1	3	75·2	60·2	8	2	·204	Fine throughout
3	·840	·746	E.N.E.	N.E.	3	4	76·0	62·8	0	0	...	Fine; windy day
4	·682	·619	E.	E.	2	1	84·0	65·0	6	6	...	Foggy morning; thunder-storm 10·30 p.m.
5	·782	·804	S.	S.	3	2	73·0	62 0	0	1	·105	Rain commenced 2 p.m.
6	·862	·777	E.S.E.	E.	2	1	74 0	60·9	10	5	·124	Showers in the afternoon
7	·727	·778	S.	S.S.W.	4	4	68·0	60·6	10	10	·015	Light showers 6 a.m.; blowing hard all day
8	·780	·757	S.S W.	S.S.W.	3	3	63·2	56·0	10	10	·010	Showery
9	·667	·677	S.S.W.	S.S.W.	2	5	72·2	56·9	10	1	·646	Showers from 3 to 8·30 p.m.
10	·802	·813	S.	N.N.E	1	1	71·4	51·0	0	0	·095	Fine throughout
11	·765	·708	E.N.E.	N.E.	2	4	76·3	56·2	0	1	...	Fine; strong wind, p.m.
12	·700	·591	W.	E.	1	1	73·3	62·4	10	10	...	3·30 to 7 p.m., wind W.S.W., thunder and rain
13	·660	·819	S.	S.	3	3	66·8	61·2	10	10	·433	Cold cloudy day
14	·864	·870	W.	N.E.	1	2	72·4	59·1	10	10	·020	Cloudy and damp; misty rain occasionally
15	·836	·737	N.E.	N.E.	2	4	72·0	62·6	10	10	·002	Cloudy; cleared from 5 to 7 p m.
16	·705	·661	E.N.E.	N.E.	2	4	76 8	65·9	2	1	...	Fine; strong N.E. wind all day
17	·774	·632	N.E.	N.E.	3	3	75·5	67·6	10	9	...	Very light shower, 2·30, p.m.
18	·518	·385	N.	N.E.	2	2	83·6	65·6	0	10	·001	Strong N.E. wind from 10 a.m. to 7 p.m.
19	·196	·054	N.	N.	4	5	92·7	65·4	0	10	·036	7 a.m. thunder and heavy rain from N.N.W., barometer 29·017 at 5·45 p.m.
20	·312	·620	W.N.W.	W.	3	2	73 2	64·0	1	0		
21	·719	·656	W.	N.E.	2	3	75·8	54·9	0	1	...	Fine throughout
22	·712	·774	W.S.W.	N.E.	3	2	79·9	58·5	0	1	...	Fine
23	·805	·754	N.E.	N.E.	4	4	75·6	58·6	7	0	...	Strong N.E. wind all day
24	·866	·868	N.E.	E.N.E.	3	2	79·0	63·3	1	0	...	Fine
25	·859	·786	E.N.E.	N.E.	3	3	77·8	62·3	2	10	...	Heavy dew; lightning at night
26	·625	·530	N.E.	N.N.E.	4	5	77·1	62·1	10	0	...	Strong wind and showers all day
27	·481	·578	E.N.E.	S.S.W.	3	6	89 6	63·9	10	0	0·10	5 p.m. thunder-storm; 5·30 strong N,W. wind, 7, strong S. wind
28	·888	30.028	S.S.W.	E.N.E.	2	1	77·5	58·8	2	10	·020	Began to rain 7·30 p.m.
29	30·129	·153	E.N.E.	E.	3	2	74·9	61·8	4	10	·286	Fine; clouded over at sunset
30	·182	·144	E.S.E.	E.	2	1	78·3	59·0	2	1	...	Fine
31	·123	·077	N.N.W.	N.E.	1	2	75·8	57·8	9	0	...	Fine
Mean.	29·749	29·743			2·3	2·7	76·2	60·9	·50	·44	2·098	Days Rain—15.

The extent of clouds is represented by the number of tenths of the whole sky, obscured at the time of observation The force of the wind is represented according to the Observer's judgment, by numbers from 0 to 6, 0 representing a calm, and 6 a violent storm.

Registrar General's Office,
Sydney, 17th January, 1859.

HEALTH OF SYDNEY.

The Mortality during the month of December exceeds that registered in any previous month of the year. The number of Deaths recorded at the Central Office was 183, viz.:—90 males, and 93 females. As was remarked of of the two previous months, diseases of the Zymotic or Epidemic class have been attended with a far higher degree of fatality than the registers have hitherto given evidence of. Scarlatina was fatal in 16 instances, and 25 Deaths are attributed to Dysenteric complaints, principally amongst children. It is lamentable to observe a great increase in the Infantine mortality as compared with the total Births and Deaths of the month. The percentage of Deaths of children under 1 year to Births registered, is 30·89. The percentage of Deaths of children under 1 year to the total Deaths, is 30·00. The percentage of Deaths of children under 5 years to the total Deaths, is 57·37. The Quarterly tables at foot shew a decrease in the number of Births registered, and an increase in the Deaths as compared with the last quarters of the previous years. It is to be feared that the decrease in the Births is attributable

to the neglect of Parents to register the Births of their children within the time prescribed by law, to which the public attention is requested. The Births of the month were 178, viz. :—92 males, and 86 females, being 5 less than the Deaths.

TABLE SHEWING THE DEATHS OF MALES AND FEMALES REGISTERED IN EACH WARD, FROM 1ST TO 31ST DECEMBER, 1858, DISTINGUISHING THOSE UNDER 5 YEARS.

WARD.	UNDER 5 YEARS.			ABOVE 5 YEARS.			UNSPECIFIED.		GRAND TOTAL.
	Males.	Females.	TOTAL.	Males.	Females.	Total.	Males.	Females.	
1.—Gipps	5	14	19	7	5	12	1	2	34
2.—Bourke*	5	9	14	14	9	23	3	1	41
3.—Brisbane	4	9	13	5	2	7	1	1	22
4.—Macquarie	1	2	3	1	1	2	1	...	6
5.—Cook	7	5	12	2	2	4	2	...	18
6.—Fitz Roy	8	9	17	2	3	5	...	...	22
7.—Phillip†	4	8	12	7	2	9	...	...	21
8.—Denison	7	8	15	1	1	2	2	...	19
TOTAL	41	64	105	39	25	64	10	4	186

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

Births Registered during Quarter ended 31st December.

	1856.	1857.	1858.
October	201	173	169
November	168	181	160
December	176	198	178
Total...	545	552	507

Deaths Registered during Quarter ended 31st Dec.

	1856.	1857.	1858
October	103	111	135
November	90	116	176
December	162	181	183
Total...	355	408	494

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1ST TO 31ST DECEMBER, 1858.

CAUSES OF DEATH.	Under 1 year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10	10 and under 15.	15 and under 20.	20 and under 25	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75	75 and under 80.	80 and under 85	85 and under 90	90 and under 95.	95 and upwards.	?	Total at all Ages.
ZYMOTIC DISEASES. Endemic, Epidemic, and Contagious	16	13	4	3	4	40	5	2	1	1	2	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	54
SPORADIC DISEASES. *Of Uncertain Seat.*—Dropsy and other Diseases of variable Seat.	15	3	...	...	...	18	...	...	1	...	1	1	...	...	1	1	2	1	...	...	1	...	...	...	..	...	27
Of Nervous System.—Diseases of the Brain, &c.	14	2	...	3	1	20	...	1	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23
Of Respiratory System.—Diseases of the Lungs, &c.	...	1	...	1	...	2	1	...	2	2	1	...	2	3	1	...	1	...	1	...	...	...	...	...	...	...	16
Of Circulatory System.—Disease of the Heart and Blood-vessels	...	...	...	...	...	...	1	...	2	...	1	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	6
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	9	11	1	1	...	22	3	...	...	...	...	...	1	...	...	...	3	...	...	...	...	...	...	...	...	...	29
Of Urinary Organs.—Diseases of the Kidneys, &c.	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Generative Organs.—Childbirth, Diseases of the Uterus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Of Integumentary System.—Diseases of the Skin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Old Age	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	2
External Causes.—Violence, Privation, and Intemperance	1	...	1	...	1	3	2	...	1	1	1	...	1	1	...	1	...	...	...	...	...	...	...	...	...	...	11
Unspecified	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14	14
Total from all Causes	55	30	6	8	6	105	13	3	7	5	7	3	5	4	2	4	6	1	1	1	1	1	...	..	...	14	183

CHRIS. ROLLESTON, Registrar-General.

SYDNEY GYMNASIUM.

[illegible]cement which has recently been made to establish a public Gymnasium in this city has our warmest sympathy and support. We avow ourselves among the number who think, that the intellectual part of man has had too much stimulation in modern times. The world has been too blind to the intimate relation that exists between mental and the bodily health, and the consequence is, we believe, a degeneration of the physical condition of a large proportion of our population. We do not mean to assert that this degeneration is exhibited with any prominence in the stunted growth, the corporeal feebleness, or in the shortened lives of the adult population, but we fear that much of the mortality prevailing among infants is traceable to the excitable nervous temperament which they inherit from over anxious and brain-exhausted parents. The prevalence of diseases which have their origin in too great nervous excitement is a marked feature of the pathology of this colony, and if the enquiry could be traced with any accuracy for years back, we think that the modern system of "living fast" mentally as well as bodily would be found to have left its traces in the injured health of all those nations who boast of their high state of civilization.

If these remarks are founded on truth—and nearly every authority of eminence confirms them,—it is quite time that we began to consider what complicated creatures we are. The ancient philopher who said, that the greatest earthly blessing was "a sound mind in a sound body" was more observant than our modern sages, who have for years extolled so loudly the pleasures and advantages of learning, that the whole duty of man seems to be comprised in acquiring knowledge. These remarks apply not only to hard students, of whom we certainly have not too many, but also to merchants, shopkeepers, and to all engaged in the harrassing pursuits of business. A walk through the streets of this metropolis will exhibit every variety of anxious care-worn expression. The sallow clerk hurrying by with infirm but hasty footsteps and the prosperous merchant, with compressed lip and fixed expression indicating the working of the mind within, need some healthy relaxation that shall waft away the cares of life, and send the blood coursing through the veins. At present there are few opportunities of obtaining this. A good brisk walk round the Domain and the Gardens, a game of cricket, or a bath in the waters of Woolloomooloo Bay, are almost the only wholesome recreations available to the inhabitants of our city.

We rejoice therefore to find that a few earnest energetic men have associated themselves to form a public Gymnasium. We need not go back to the records of Ancient Greece or Rome to prove the advantage of these institutions. Modern nations are finding out that the physical education of the population has been neglected too long, and in England parks and gymnasia are now attached to almost every large town, while on the Continent the study of gymnastics is a regular branch of the education of youth.

Although we are not at all inclined to call on the Government to assist individuals to perform duties that they ought to be proud to assume voluntarily, yet there is one point of view in which this movement may be regarded, that gives it a national importance. If, as is so often said, "Australia has been precipitated into a nation"—if we are ambitious enough to claim the title of a State, it is quite time that we made some provision for its defence. A nation without the power of defending its soil from the aggression of a foreign foe, is rather a pitiable spectacle. It lies at the mercy of every bold buccaneer. Now, although it is quite true that the whole might of England is pledged to assist us in case of invasion, it should be remembered at what a distance that mighty arm is wielded, and that before it could be brought to bear to punish the aggressor our country might be ravaged. The fortifications are all very well for the protection of this city from attack by sea; but the whole of the Colony is notoriously at the mercy of the smallest organized land force. As it is acknowledged to be one of the first duties of every Government to provide for the defence of the State, it is highly incumbent on them to encourage institutions that develope in every way, the physical powers of the defenders. What has hitherto been done in this way here? A Volunteer corps was formed, but it was suffered to perish

for want of the merest pittance from the public funds, and what was worse, it was exposed to unmerited ridicule by officious interference and unworthy patronage.

We believe that it would be a far better course, to support, by appropriations of convenient allotments of public land, the formation of Gymnasia or Exercising Grounds, and also to erect in various convenient places in the metropolis and the principal towns, free public rifle galleries, where the youth of the colony might train themselves to the use of arms, as assuredly they would, if not meddled with and placed under vexatious restrictions. This subject must come under consideration some day or other, and the sooner a beginning is made the better. War may come as a thief in the night, and find us all unprepared.

But another evil—ill health—has come upon us already. The Registrar-General tells us that Sydney is now as unhealthy as the City of London in the worst year of the Cholera. This is a shocking statement, and it derives additional poignancy from the conviction generally entertained, if not commonly expressed, that the causes of this mortality are easily preventible, and that the apathy of the colonists alone is responsible for their existence.

In the present article we will not enquire into the numerous depressing influences that may account for this mortality that are foreign to our subject, but we assert that regular bodily exercise would do much to improve the public health. This exercise the Sydney Gymnasium proposes to stimulate and supply. It is the duty therefore of every well-wisher of the colony,—those who desire that young Australia should grow up manly, self-reliant, and worthy of the noble stock from which it sprung, to support this proposed establishment. In conclusion we would remind all the youth who may be within the sphere of our influence, that great nations depend for their existence on stout hearts, strong arms, and healthy parents no less than on free institutions and responsible government, and the adoption of a modification of the British Constitution.

TRANSACTIONS OF THE PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

ON THE ORES OF MERCURY.

BY THE

REV. W. B. CLARKE, M.A., F.G.S., F.R.G.S.

(Continued from our last.)

Mr. T. S. Hart writing from San Jose, in Nov. 1852, says, there is a soda spring in the neighbourhood of the mine, and that the water is used in making bread, and certainly as fine bread as ever was eaten. At that time the produce of mercury was 75,000 pounds a month. The ore was placed in furnaces, by which a gentle and regular heat sublimed the metal, which was condensed in drops out of little pipes at the bottom of the chamber. The furnace was cleaned out once a month. The effect of the vapour on the person who breathed it was saliration. The working of the crude ore is by a tunnel 900 feet long, 10 feet wide, and 10 feet high, with a rail road all through. The miners are all Americans. The Indians had previously pierced the hill to the depth of 60 feet. They must have suffered great calamities in searching for vermilion, for Mr. Hart mentions, that a vast heap of human bones was found in a chamber the roof of which had fallen in upon them.

Mr. Blake of San Francisco in a letter to my friend James D. Dana of Newhaven, dated 14th February, 1854, says, the hill consists of hard serpentine and trap, with outcrops of sedimentary rock, chiefly argillaceous shales and layers of flint (? chert) much tilted and contorted. They are supposed to be of Silurian age. Similar rocks occur north of San Francisco harbour. The ores are bedded with the strata, in pockets, and are traversed by veins of carb. lime, which cut through and fault them. The bed contains crystals of cinnabar with bitumen, sulphuret of iron, sulphuret of copper, arsenical pyrites in small quantities, and a little gold. The working and reduction of the ore are now much improved; and by the admission of atmospheric air into the chamber, the vaporised sulphur is converted into sulphuric acid, and separated from the mercurial vapour, preventing a re-combination. But some of the mercury escapes and deposits itself in a grey coating on the top of the chimney.

A new locality was discovered lately near Sonora. Mr. Blake, in a paper on the Extent of the Gold Region of California and Oregon (A. S., July 1855), mentions the Guadalupe Mine and localities at Monterey; but gives no particulars.

A correspondent of mine, Professor John B. Trask, of California, reported in 1851, that he had found a piece of cinnabar on a hill, east of San Lorenzo (in the northern part of Santa Cruz), which is south of San Francisco, but he has doubts whether it was not dropped accidentally.

The effect of all these Californian discoveries has been to reduce the price of mercury very considerably, as proved by the sale of it in Mexico and Peru.

Mr. Wilson, who was the Geologist in Mr. Gregory's Expedition to the N.W. coast of Australia, in 1856, has reported, that he found vertical veins of cinnabar ranging through the strata, with an easterly dip. He says it it is red, but different from any he had before seen, and that he is satisfied it is identical with a red mineral he had frequently seen in Australia (*i.e.* in Victoria), but supposed there to be an ore of iron.

I do not rely much on Mr. Wilson's opinion;

as he has also reported in another paper (J.G.S.) that the top of Nobby, at Newcastle, is covered by a bed of trap conglomerate. But that I know —and so I told him—is a mistake of his.

I, therefore, doubt his statement about vertical veins of cinnabar, for that contradicts the experience of all other observers, who speak of it as occurring in beds, which is its position also in Spain, as we shall see further on.

This brings us to the condition in which it is found in the latter country, and as one of the principal objects I have had in view is to point out the geological relations of mercury, in order that I may assist those who are looking for it in Australia, I cannot conclude without entering into some detail respecting its occurrence in Spain.

I am chiefly indebted for this information to Senhor Casiano de Prado, a geologist of rising eminence in that country, and to M. de Verneuil, whose papers, read before the Geological Society of France, contains much valuable matter. To these and a few others, among them Don Joaquim Ezquerra del Bayo, the science of geology is indebted for its present patronage in the Peninsula, where till recently it was not cultivated. To Casiano de Prado we owe a luminous account of the country round Almaden, of the Sierra Morena, and the Mountains of Toledo. So far back as 1850, Ezquerra de Bayo had pointed out that the silurian formations characterize the Sierra Morena from Santa Cruz de Mudela to Almaden, with its remarkable deposits of cinnabar; but he had not arrived at the knowledge, since obtained by Casiano de Prado, either as to the structure of the country, or as to the fossiliferous strata by which its geological age has been determined. The researches of the latter brings up our information respecting mercury to Feb. 1855, and therefore it belongs to the period to which this paper is limited. I will be as brief as possible in my references, but some details are necessary.

We learn then, that it was only towards the end of the last century, that the Almaden mines began to be properly worked, when German engineers were introduced by the advice of Bowles, whose predecessor, Hopensack, knew very little of Geology. In 1830, Cas. de Prado made the first petrographic plan of the principal mine, which was actually of the depth of 767 feet under the town of Almaden. He then observed, that the stratification was excessively deranged and the beds of various colours, an observation of great importance to his future labours as Director.

Thirty years before, Beudant had stated, that the mercury belonged to rocks of that part of the once-called New Red Sandstone, which is nowcalled Trias. M. le Play, still later, considered the rocks to be grewwacke, a term long used to classify what people did not clearly comprehend. But it was in 1850, that M. de Verneuil proved that the fossils belonged to the devonian and silurian epochs, and so set the question as to the age of the strata at rest. And it was de Prado who afterwards worked out the order of superposition of the respective beds, made out the relations to those of the igneous rocks of the neighbourhood, and the epoch of the first appearance of the cinnabar. This occupied him till 1853. The difficulty of this undertaking was very great, owing to the dislocated and deranged state of the wild and till then unknown country examined by him. It appears, that the formations more recent than the Trias are not much disturbed, but that the older formations must have been subjected to all kinds of convulsions and denudations; so that the chalk marl, for instance, at very trifling intervals of space, covers either the Lias, Trias, Silurian, or Gneiss. The Permian formation seems not to exist. The Carboniferous, Devonian and Silurian are always in that district, highly inclined: so much so, that at the east end of Sierra Morena, beds dipping 70° to N.N.E., support horizontal beds of Trias. It is clear, therefore, that the older formations had been thrown into their present state of derangement before the Trias period. In the Sierra Morena, the Upper Silurian has not yet been discovered.

The Lower Silurian occupies not only there, a great development, but also in Estramadura and Toledo and elsewhere in the heart of the Peninsula.

The most abundant rock of the Lower Silurian in Spain, is a black schist,—black from carbonaceous matter; a white schist exists, which is used to wash the houses; but the schist is usually grey or brownish and much stained by oxide of iron. It changes also to red, yellow, and blue, is sometimes micaceous, and sometimes earthy. The roofing slates so common elsewhere in and out of Spain, are not found in Toledo or in the Sierra Morena.

Another peculiarity is, that these schists contain nodules of iron pyrites, either spheroidal or oval, which are sometimes hollow. These are found at Almaden, nearly in contact with cinnabar, sometimes encrusted with pyrites, sometimes with cinnabar, and in these very soft schists the silurian fossils are found. Their age is therefore clear. The softer the rock the greater the number of fossils; when the former becomes hardened, the latter disappear. At Ciudad Real, graptolites, which are a characteristic silurian fossil, are found impressed as casts on the pyritous nodules, which are in that case covered by a shining black plaster, and are modified in form.

Next to the schists, a quartzite is the prevailing rock. It is hard, ferruginous, or white and traversed by threads and veins of quartz. Soft schists—grey or brown, white quartzites with quartz dip S. W. and the fossil of Theca de los Ovejas is identical with a species not uncommon in this colony at Illawarra, (Black Head, Wollongong, &c.) It passes to a fine pudding-stone in some places. But at Puertollona, Abenejar, Luciana, and at Nava-de-Ricomalillo, it becomes a great conglomerate, as well as in the mountains of Toledo, where it contains gold.

There is a phenomenon which is very curious in connection with the cinnabar. The white quartzites become black, in contact with the black schists; the only fossils in the quartzites are fucoids, which are denominated bilobites, and some terrestrial plants, the former of which are always parallel with the beds, though the former are occasionally vertical.

There is a still more curious rock, which the miners call "*piedra frailesca* or franciscona"—because its colour is that of the dress of the Franciscan friars, a peculiar grey; it varies from a calcareous concrete to a dolomitic breccia. But though it contains devonian fossils at Guadalperal, at Almaden, where it contains Bilobites, it is Siluran; so that a rock of similar kind is common to both epochs, and it contains Cinnabar in both. At the former place, as proved by Roman medals, lamps, and other articles, it must have been worked for Cinnabar in the times of the Roman possession of Spain, before the Christian era.

It is remarkable, that this rock has never been traced in Spain beyond Almaden; it is never

fund there in the quartzites, nor does it contain olspar.

Granite and other igneous rocks occur in the Sierra Morena in the neighbourhood of Almaden; the former sends veins through the Silurian rocks without altering them; passing to porphyry with six-sided prisms of pyrites, but holding little quartz, and also to basalt. Argentiferous galenu occurs in the porphyry, which also holds patches of silurian schists showing that like the granite it is younger than they are. The basalt is younger still.

These details are absolutely necessary to explain the exact position and supposed origin of the cinnabar at Almaden.

Notwithstanding the extent of the formations just described, it is only in a very limited area that the ores of mercury are found. There may be fifty localities in all; but the rich are few. They always occur in the *sedimentary* rocks, never in the igneous, though an igneous origin, by vaporisation or infiltration upwards, is the best explanation of their origin. Devonian fossils occur in the cinnabar beds, as in Idria. Not only the fucoid bilobites, but trilobites (crustaceans) occur close to the mercury in some parts. The silurian rocks contain the most abundant and workable masses of mercury.

Hence arises a very important and interesting question—What was the actual period of the first appearance of mercury in these formations?

It is quite clear, the mercury is not contemporaneous with the rocks themselves. There is a similar question started with respect to gold. My friend Sir R. Murchison has attempted to show, in the case of the latter metal, that in the Ural and Siberia, the rocks have been changed with gold since the Permian epoch. But in Spain, there are no Permian rocks that can be compared with the mercury beds. Perhaps, the Permian rocks in Russia ought not to be admitted into the question of gold, till they have been examined to their base. But reasoning in his own clever way, Sir Roderick concludes, that gold is one of the most recent of products. It is also believed, as stated before, that mercury is a much more recent product than the rocks in which it is found. Only in one case, has it been discovered in the neighbourhood of an igneous rock in contant with the sedimentary rock. But as that was in a pit dug at the basement of a house, it is conjectured, that the metal had been deposited by a thief and had infiltered into the soil; a parallel case with one alluded to in these colonies, at the commencement of this paper.

Another curious fact is, that mercury does not occur in veins, by itself. Whenever its ores occur in veins, they are always subordinate to other metals, and in small quantities.

In Idria, at Almaden, at Guancavelica, at Zwei-Brücken, in the Palatinate, in Hungary, in Tuscany, in Austria—in all these distant and different parts of the earth—wherever mercury occurs, it is in *beds* and not in veins, except as above stated with other metals, and in small amount, and near the surface.

Once people thought that all metals were in veins, but now they know better. Gold, for instance, occurs invissibly disseminated in quartz and other substances, in other metals where it is equally invisible, and from de Prado, we learn, that mercury though visible has come up from below and has eaten into the rocks in which it occurs. For, when the cinnabariferous quartzites are subjected to heat, the stone is left in a carious state and friable, showing that the mercury has eaten into it. No one *can* pretend, it was always so: how then are we to explain, how quartzites that must once have been entire have lost some of their substance and have had it replaced by mercury?

There is probably no other explanation than this—the very same which, independently of the present subject, I offered long ago in reference to gold,—that the mercury has been combined with the rock by substitution and assimilation, under the influence of galvanic forces. Nor is this substitution confined to the quartzites—it occurs in the black schists, and in them, the mercury assumes the schistose structure, passing between the foliations, and changing its colour from scarlet to a dull red.

Now, if any one think it strange that mercury should occur in beds, it may be answered, it is not stranger than that iron should occur in beds. This colony is full of examples of such beds. It is not pretended, that iron never occurs in veins, but when it does it mostly occurs with other metals and minerals. Thus, taking the great iron veins of the Erzegebirge, we find from Cotta, that there are no less than 26 mineral substances found with the iron in these veins. If then, iron, the most abundant of metals occurs in beds, why not a less abundant metal, as mercury?

Another feature of mercury is, that its ores occur sometimes richer and sometimes poorer in depth. The questions I asked at our last meetings of Captain Ward, respecting the state of gold at Clunes, in regard to depth, had a bearing on the theory stated by Sir R. M., that gold always decreases in depth, which, as a general rule, I very much doubt; and the case of mercury justifies my doubts. At Almaden, it grows richer in depth,—at Almadenjoz, the contrary.

A further distinction of mercury is, its solitary character. It seldom occurs with others. Even the iron which is associated with it, is also in a state of sulphuret. This has been long noticed by De Jussiex, by Werner, and by Burat.

It appears to be connected with the general principle, that metallic minerals in beds are always solitary and isolated: it is only in veins that metallic minerals are gregarious. A somewhat surprising characteristic distinguishes mercury. In the laboratory, even cold mercury combines with other metals; but in a state of nature it has no general affinity with them, and exists in a state of indifference to them.

Mercury in veins is, therefore, not a normal, but an accidental phenomenon. Other metals have their partners; gold weds with silver; silver with lead; tin with tungsten; and nickel with arsenic. Mercury prefers a state of single blessedness, except in one particular and very remarkable instance

The only intimacy which it is known to entertain is with carbonaceous and bituminous substances. At Almaden and elsewhere, in that vicinity, it is associated with black schists, which derive their colour from carbonaceous matter so dense as to soil the fingers. And it is to this fact, that we trace its connection at Almaden with the Silurian in preference to the Devonian rocks, because the latter contain no such black beds as the former.

The same thing occurs at Durazno in Mexico, where fragments of coal have been found in the very midst of the deposits of mercury.

In the Asturias, De Prado also found cinnabar and coal together, without the coal having been altered and this is his reason for supposing that the mercury was introduced *cold*, or at any rate without any great excess of temperature. The cinnabar of the Asturias is wrought in the coal measure limestone, and in the coal itself.

It may be safe to add, that in Rhenish Bavaria quicksilver occurs sparingly in vein stones and in amalgamation with silver, but the quantity is inconsiderable. Having been myself over the ground, I can assert, on the authority of observation, that the formation, in which these rare veins occur, belong not to the Devonian or Silurian, but to the Carboniferous formation, in which occur intrusions of greenstone.

The evidence as to the ages of the formation round Almaden is to be found, as before stated, in a memoir by M. de Verneuil, read to the Geological Society of France, on 4th June, 1855, in which he has described and figured, known up to that date, 56 Silurian and 62 Devonian species.

It is necessary to state, in connection with some preceding remarks, that in the same part of Spain, between Almaden and Cordova, there are the richest coal fields in the Peninsula, although the Carboniferous formation occupies in Spain only, a very limited area compared with the older sedimentary strata below it.

It now only remains for me to add to the preceding account a few tabular statistics, and with them I will conclude,

Humboldt tells us, that in 1802 almost all the supply of mercury from all parts of the world was consumed in America. We know also, from the same author, that the whole quantity so employed, amounted to 1·227·750 French kilogrammes. But in 1855, the supply was 3·489·590 kilogrammes, of which—

Spain produced	1·964·470
Austria	245·550
Rhenish Bavaria	4·910
Peru	294·660
California	980·000
	3·489·590

Therefore, in 1855, the supply was nearly three times what was employed in 1802, or according to Heron de Villafosse, about twice as much as was produced in 1802, rather more than 3400 tons.

The Spanish portion of supply is still consumed in the silver mines of Peru and Mexico. The Austrian is consumed in Europe.

There is an instructive table relating to the prices of mercury, given in a Russian work of Terassensko Otreschkoff, to which I am indebted for some of my information, and which is worth quoting. He says, the value of a kilogramme has varied as follows, giving French values.

	fr. c.
In 1590—Mexico	22 13
1750—America.....	9 74
1767-1776 do.	7 34
1777—Spanish mer. (America)	4 72
1777—Austrian.....	7 44
Same time Spanish (Mexico) ...	6 80
Ditto Austrian.....	8 42
Before 1810, i.e., before the separation of Mexico and Peru by Spain, the price was....	2 20
In 1852—Rothschild sold it at the Mexican mines.....	5 28
Ditto, at Guanaxuato.....	7 44
In 1855, the same house sold it in Spain, at.....	2 25
It cost them	0 80
And in 1854, the price was so much diminished owing to the Californian discoveries, that at the mines of Mexico, it sold for only.....	4 60
And at Guanaxuato for	2 93

I have not much to relate respecting other countries, but the fact has very much struck me, that whilst (as I learn from a recent Blue Book published by the British Parliament) there was in 1853, an importation of quicksilver into France of 139·632 kilogamme, and in 1854, 116·008, those was no exportation from France; whereas in Belgium there was a considerable importation from 1852 to 1855, with an exportation of mercury varying from 1-15 to 1-5 and ½ of the importation; so that France appears to use all the mercury imported, and Belgium to carry on a trade in it. But we do not know, what portion goes to the Belgian colonies; though Martinique receives a portion from France. In France and Belgium, 1853 was the year of greatest supply between 1852 and 1855, and in 1851 there was the greatest supply to Martinique. By the kindness of Col. Gibbes, I am enabled to state, that so far as we in this colony are concerned, up to 1852, mercury was entered at the Custom House under the head of drugs, as corrosive sublimate is now. But in 1853 when it was begun to be used for extracting gold, quicksilver increased in value as an import in the following scale.

In 1853, value . .	£24	in all £3241
1854 „ . .	200	
1855 „ . .	237	
1856 „ . .	1905	
1857 „ . .	875	

This is the value, not the duty, as mercury is duty free.

Reckoning the value of all the mercury supplied throughout the world, excepting China, as before given, and at the price at which it was sold in Spain, by the Rothschilds in that year, its actual value was about £340,000 sterling.

Finally, it may be said, that as the working of quartz veins increases by machinery, in that proportion will the necessity of an increased supply of mercury be felt; and if now, as is the case in Europe and America, there is complaint of the cost of mercury, this complaint will also increase unless the development, begun in California, should make rapid progress.

The supply of mercury, therefore, must have a double influence on the supply of silver and gold, and perhaps, the want of a sufficient supply may lead to the discovery of other schemes for the reduction of the precious metals; at this date, amalgamation and the improved machinery in use, are the best aids the gold producer has ever yet had. But it is impossible to say, what prospects may be offered to the world by the future progress of chemical and metallurgical operations.

METEOROLOGICAL OBSERVATIONS IN AUSTRALIA,

BEING A CONTINUATION OF THOSE PUBLISHED IN WAUGH'S AUSTRALIAN ALMANAC, FOR 1859.

By W. S. JEVONS,
(Lately) Assayer in the Sydney Branch of the Royal Mint.

(Continued from our last.)

FURTHER REMARKS RESPECTING THE HOTWIND OF NOVEMBER 9—11TH, 1855.—*See page* 162.

CHRONOLOGY OF HOT WINDS.

From newspaper intelligence I find that these hotwinds extended with almost uniform severity from Moreton Bay to Port Phillip or over a distance of nearly 800 miles. At Moreton Bay,

however, the features of the gale were somewhat changed, there being a severe thunderstorm with much rain and a heavy southerly squall on the evening of 11th, and a westerly gale next day. At Melbourne the gales from the N., N.W., and W.W.W. amounted almost to a hurricane. Many vessels in Hobson's Bay drove from their anchorage.

The bush fires in New South Wales were very extensive. From Windsor we learn "to add to all,—and what was worse than all—the bush was on fire in many places particularly between Windsor and Penrith, and towards Pitt Town." At Parramatta the fires commenced on the 9th, "rushing through the North Rocks, in an easterly direction, sweeping through the Field of Mars, Pennant Hills, Castle Hill, Dural, North and South Colo, Lane Cove, and Hunter's Hill.

On the last two days, 10th and 11th, the bush fires were very extensive around Sydney, especially along the North Shore, and in the evening of the 11th, during the height of the "southerly," the singular sight was presented of 20 or 30 fires blazing at various distances and at all points of the compass, over the surrounding woody country.

It is not easy to state exactly how many days of hot wind occur in any place. In Sydney, there were about ten during the summer of 1855-56, eight during that of 1856-57, and seven during that of 1857-58. These were distributed as follows:—

September.....	1 day	January	8 days
October.....	2 days	February.....	3 days
November.....	6 days		—
December.....	5 days	Total.....	25

Hot winds are most frequent and severe, I believe, in November and December. During extraordinary seasons they commence in September, and they have been known to happen as late as April. They may blow from any point between N. and W., but the average in Sydney is N.W.

The following are a few instances of the severest hot winds and bush fires that I have met with

1827. February.—South Creek and Hawkesbury.

1831. December 6.—Bush fires along Nepean and South Creek.

1836. January 15th.—Hot winds in the country and within a few miles of Sydney where, however, nothing was felt. Maize crops and gardens suffered much. The same curious circumstance happened again on January 20th.

1839.—On October 24th, 25th, and 26th (at conclusion of great drought) fearful hot winds, doing much damage in all parts, especially about Goulburn, Yass, and the Maneroo country.

1841. October 10th and 11th.—Destructive bush fires at Windsor and Campbelltown and the country between.

1842. October 21st.—Bush fires at North Shore and Botany. November 23rd.—North Shore on fire for five miles. Fires at Newtown. December 1st.—Bush fire still burning from Billy Blue's Point to Mossman's Bay. Fire engines saved several houses. Bush in the interior very extensively on fire.

1846. April 11th.—Hot wind. Bush fires in various directions, especially at Kissing Point.

1847. February 25th, 26th, and 27th.—Hot winds at Geelong. Heat so excessive as to put a partial stop to business.

1851.—About February 6th of this year there occurred, in the colony of Victoria, the greatest bush fires of which we have any information. They occurred at or between the following places:—Geelong, Indented Head, Western Port, Pentland Hills, Portland, Belfast, Kilmore, the Plenty (river), and from the Goulburn to the Broken Rivers. These comprise a great area of country, and the extent of the fires may be judged of from the fact that the smoke produced a haze over Tasmania, and that particles of burnt dust, or "small dry dark burnt-looking leaves" fell at Alberton in Gipp's Land, and on the Diana, off Kent's Group in Bass's Straits. On board this vessel, the thermometer rose to 98 deg., the wind blowing in gusts from W. and N.W.; a haze also covering the sky and rendering it dark almost like night. At Goulburn, N. S. W., there was intense heat. February 5th-7th, temperature not falling below 98 deg. At Sydney there was a dense haze and a damp north wind.—(*Sydney Morning Herald*, February 12th, 19th, 1851.)

1857. January 3rd.—Great bush fires near Geelong.

I will now enquire how hot winds are felt in other parts of the Australian Continent.

Mr. Westgarth (p. 38) states that hot winds are more frequent but less severe at Port Phillip than at Sydney. The temperature at Melbourne may rise to 100 deg., and the "southerly" occasions an instant fall sometimes of 25 deg. or even 40 deg. The hot wind there comes from the N.N.W. in general.

In South Australia it is well known that north winds are the most intensely heated.—(Eyre). When at the head of the Great Australian Bight Mr. Eyre experienced fearful hot winds from the N.E. point, during the month of January. He speaks of "an oppressive and scorching current of heated air, like the hot blast of a furnace. * * * Often as I had been annoyed by the heat, I had never experienced anything like it before."—(Vol. i., p. 273, also p. 293, 308.)

In Western Australia "the hot winds which blow from the north are very sultry, and if long continued (which rarely happens) they shrivel up the leaves." (Martin, vol. iv. p. 478.) Again, "the thermometer rises sometimes during the continuance of a land wind in the month of February, in the shade, to 105 degrees ("Western Australia" p. 55.) The N.E. wind brings a parching heat from the land. (Nau. Mag. 1841, 721.)

On the N.W. coast, the S.E. winds during the summer months have the properties of a hot wind.

When Capt. Stokes was off Roebuck Bay (lat. 18 degrees) on that coast and distant 100 miles from land, a strong S.E. wind covered the rigging with a fine dust composed of sand and wood ashes. (Stokes, vol. 2 p. 368.) Count Strzelecki noticed in similar circumstance during a hot wind under 60 miles off Port Jackson. The impalpable dust was at first mistaken for ashes but proved to be chiefly sand. (p. 175.)

In the neighbourhood of Exmouth Gulf (N.W. coast), a wind blew from the S.E. (Capt. King,

vol. 1 p. 33), " which from its heat and the listless sensations, it resembled the hot land-wind of Port Jackson."

When upon Albinia Downs, in the N.E. quarter of Australia, Dr. Leichhardt notices a hot wind blowing from the S.W., on December 29th, 1844. (p. 87.)

I have also seen it stated in a pamphet on the Canterbury Settlement, New Zealand, that the N.W. wind possesses even there the characteristics of warmth and *dryness*. It occasions the snow to melt in large quantities in the Snowy Mountains, and floods ensue in the low country.

It may seem almost superfluous, thus to prove by instances that wherever a wind pass over a large area of land, during the summer months it will become both exceedingly hot and dry. We can infer, however, from such facts what must be the condition of the atmosphere over the whole Central area of Australia. Capt. Sturt, indeed, penetrated far into that area, and his remarks on the heat of the air and ground are of unsurpassed interest to the meteorologist. All writters describe a hot wind allegorically as the " blast of furnace," but Sturt lets us into the secret of that vast natural furnace from which it is really derived.

Again, " There were only two occasions on which the thermometer was noticed to exceed the range of 130 deg. in the shade, the solar intensity at the same time being nearly 160 deg." Dew was almost unknown in these regions and " If I except," says Sturt " the rain of July, which lasted, at intervals for three days, we had not any for eleven months," (vol. ii. p. 21.) Under these circumstances " flooded plains," that is plains which showed marks of occasional great inundations, were rent by cracks 4, 6, or 8 feet deep. These facts prove the dry as well as the heated condition of the air in the interior. To the same effect are the following remarks of Mitchell. (Three Exped. i. 319.) " I had been sensible of a parching and unseasonable dryness and warmth in the winds from that quarter (N.N.W.) throughout the winter," while in the far interior (River Bogan.) He says also in striking language " there seemed neither on the earth nor in the air sufficient humidity to feed a cloud."

I must add a few remarks on bush fires.

Sir T. Mitchell makes the following comprehensive statement:—

" The trees and shrubs being very inflammable, conflagrations take place so frequently and extensively, in the woods during the summer, as to leave very little vegetable matter to return to earth. On the highest mountain, and in places the most remote and desolate, I have always found on every dead trunk on the ground, and living tree of any magnitude also, the marks of fire, and thus it appeared that these annual conflagrations extend to every place." (Two Exped., vol. ii. p. 328.)

Bush fires may originate in three ways.

1st. Accident or carelessness of the inhabitants.

2nd. Intentionally by the Natives or Squatters.

3rd. By natural causes.

The first is the cause of most bush fires within the settled districts, but stockholders burn parts of their runs in the proper seasons in order that fresh and sweet crops of grass may spring up; at least those who are not influenced by the erroneous notion that, burning the grass injures the richness and density of the natural turf."—(Leichhardt, p. 355). Dr. Leichhardt also observed that in parts of the N.E. country he travelled over, the natives systematically burnt the grass round every water-course and every waterhole, probably to attract game to particular spots.

That bush fires may often originate from purely natural causes such as the friction of trees or lightning seems probable. One instance at least almost proves it, viz., that when Flinders first discovered Kangaroo Island (South Australia), in 1802, there were the vestiges of a great bush fire which had occurred 10 or 20 years before. Yet that man had never before set foot upon it was evident from the absence of any vestige of his visit, and from the excessive tameness of the kangaroo, seals, and other animals.—(Flinders, vol. i. pp. 171-2.

THE HOURLY VARIATION OF THE THERMOMETER AND BAROMETER IN SYDNEY.

From Twenty-Six Series of Hourly Observations.

The following numbers show the average departure of the temperature from the mean of the 24 hours. For comparison, I add the similar results obtained at the Royal Observatory of Hobart Town, during eight years of continuous hourly observation.

Hour.		Departure from Mean.		Hour.		Departure from Mean.	
		Sydney.	Hobart Town.			Sydney.	Hobart Town.
A.M.	6	— 6·4	— 4·8	P.M.	6	1·3	1·8
	7	— 4·8	— 3·6		7	— ·5	·1
	8	— 2·1	— 1·8		8	— 1·3	— 1·1
	9	1·3	·5		9	— 2·7	— 1·9
	10	4·6	2·6		10	— 4·0	— 2·6
	11	7·3	4·6		11	— 4·7	— 3·1
NOON	12	9·3	6·1		12	— 5·1	— 3·6
P.M.	1	10·1	7·0	A.M.	1	— 5·8	— 4·0
	2	9·6	7·2		2	— 6·4	— 4·4
	3	8·6	6·7		3	— 6·5	— 4·8
	4	7·4	5·7		4	— 6·9	— 5·1
	5	4·3	3·9		5	— 7·1	— 5·2

The mark — before a number signifies that the temperature at that hour is so many degrees below the mean of the whole 24 hours. Where the mark is omitted, it is above the mean. The moment of greatest heat, throughout the day, is about 1 p.m. in Sydney and 2 p.m., or probably between 1 and 2 p.m. at Hobart Town. The minimum of temperature is, at both places, about 5 a.m., happening, as is usual, just before sunrise. The points of average temperature are between 8 and 9 o'clock in the morning, and about 7 o'clock in the evening. These are about the same times as in England.

WINDS OF AUSTRALASIA.

In the preceding pages I have described and discussed the most remarkable separate phenomena of the *weather* in various parts of Australia. But the great cause of all weather is the *wind*, the connecting link of all meteorological facts; the Great Locomotive of the Globe. Winds are not local and fortuitous occurrences, they are vast streams of air ceaselessly traversing the surface of the earth from pole to equator, from one continent or ocean to another. In one place licking up as a single day's work, a million tons of water, the next day depositing them equally and gently a thousand miles away. Now sweeping a desert sun-heated plain and carrying away more warmth than all man's fuel could produce. Soon after turning this *warmth* into *force* and *motion* at the great equatorial region of calms and ascending winds. Thus producing those constant trade winds which never fail the navigator. Now rising far above the highest mountains, that in uninterrupted currents they may regain those polar latitudes where warmth is so much needed, and having fulfilled one purpose instantly to recommence another course of duty.

If the winds were for once to become visible, and a person from a suitable distance in space could view a whole hemisphere of the globe, he would see it covered by innumerable streaks of wind, all curved and involved together in the most complicated manner, but yet preserving a kind of system or routine of duty which ensures each climate against arbitrary change. He would learn more of meteorology than all meteorologists have done, for he would have a view of that complete edifice of which they can only learn the nature and use by examining separately each disjointed part and divining how they might be placed together.

Considering that winds neither begin nor end, are neither produced nor spent in any single spot, we shall learn nothing by considering the winds of one spot alone, unless we understand their position in the general system or edifice of winds. What then are the internal winds which may affect the Australian climate.

Australia, including Tasmania, extends from latitude 10 deg. S. to 44 deg. S. In the adjoining oceans, a similar area would be occupied by two or three systems of very distinct winds, viz.:—1st, The strong constant westerly winds of the Southern Ocean, up to latitude 23 deg. 30 deg. south; 2nd. Constant S.E. trade winds, extending thence to within 12 deg. or 15 deg. of the equator; and 3rd., the alternating or monsoon winds of the Indian Ocean.—(Horsburg, i., 112, 125, &c.) The general nature and extent of these great currents have long been known; the recent investigations of Lieutenant Maury, the result of which may be seen depicted on the new wind-charts of the British Admiralty, have added confirmation. These zones of winds depend, it should be particularly remembered on the position during each season of that parallel of latitude on which the sun's rays fall perpendicular and with most effect, consequently as the sun moves through the signs of the ecliptic from 23 deg. north to 23 deg. south in declination, the wind must also move up and down in latitude through an almost equal range. Thus are simply produced many changes which at first seem inexplicable. I will now describe in as brief terms as possible the nature and course of the winds at each separate part of Australasia.

In Western Australia the most prevalent wind by far comes from the southwesterly direction throughout the whole twelve months.

During winter it is the S.W. point at which the wind always settles after the N.W. gales which during that season from time to time occur, during summer, the regular sea-breeze usually commences at S.W. or S.S.W. drawing round to the eastward of south during the course of the evening. Alternating with the day sea-breeze, is a land breeze, which usually commences from the S.E. point about sunrise and gradually becomes more easterly. It lasts till near noon, and then, after a short interval of calm, the sea breeze sets in. For the most part, therefore, the wind in Western Australia is from some southerly point during summer. At times the land breeze instead of dying away grows stronger and veering to N.E. becomes warm and parching. Gales also commence with a N.E. or N.N.E. wind, which then invariably veers to the westward, blowing most strongly between W.W.W. and W.S.W. These gales bring dark gloomy weather, which clears however as soon as the wind reaches S.W. It is during winter that such gales mostly occur, and that the southerly winds are most interrupted by currents from north and west.—(Capt. Wickham, Nau. Mag., 1841, 721.)

In the open sea between Cape Leuwin (S.W. extremity of Australia) and Bass's Straits, the winds blow generally from the westward. The strongest and most durable winds coming from the S.W., produce a long and high *ground-swell* which breaks incessantly upon every exposed part of the southern coasts. On the western side of Tasmania there is, from this cause, as much surf in fine weather as upon the east coasts during a gale, and an open boat can never approach this coast.—(Trans. Roy. Soc., V. D. L., 1851, p. 295.)

Gales commence from the N.W. with thick weather and a falling barometer. They blow most heavily at the S.W. point, becoming moderate, with fine weather, when the wind veers to S. or S.S.E.

Nearer shore, in the Great Australian Bight, the winds are probably of the same character as those above-described during winter, but during the summer months moderate winds between S.E. and E.N.E. prevail, partaking of the nature of land and sea breezes.

At Portland Bay (S.W. coast of Victoria) there are land and sea breezes from the middle of November to the middle of March. Much changeable weather then occurs till the westerly winds set in about May.

I now give in a tabular form more exact information concerning the prevalence of various winds at Port Phillip, and other important points to the eastward. The numerical results for

Sydney, Port Macquarie, and Melbourne have been carefully reduced from the Monthly reports in the Sydney *Government Gazette*, commencing with 1841.

The results for Launceston are from Dr. Pugh's observations (Trans. Roy. Soc. of V. D. L., 1851, pp. 178, 266); but the local form of the land there, much influences the direction of the winds. My data for Norfolk Island only refer to the period of 331 days from March 19th, 1790, to February 12th, 1791; they were recorded by Captain Bradley, and are reduced from a table in Captain Hunter's Journal, p. 199.

Direction of Wind.	Sydney.		Port Macquarie.		Melbourne.		Launceston.	Norfolk Island.	
	Summer.	Winter.	Summer.	Winter.	Summer.	Winter.	Summer and Winter.	Summer.	Winter.
North—N.E.....	50	28	43	33	19	33	10	22	39
N.E.—East.....	28	14	34	20	3	11	2	26	25
East—S.E.....	21	10	13	7	7	6	2	36	11
S.E.—South.....	49	23	51	33	55	28	23	23	18
South—S.W.....	13	30	21	31	53	32	3	12	29
S.W.—West.....	8	42	11	29	18	21	43	17	50
West—N.W.....	6	27	4	19	10	18	8	4	12
N.W.—North.....	6	10	4	12	16	35	164	8	21
Calm and variable ...	..	..	..	..	..	..	110	19	9

In the above table, summer is supposed to be the half year, beginning with November and ending with April.

At Melbourne, winds between S.W. and south are more common than any other, but while for 108 days during the summer, the wind is between S.W. and S.E., there are only 60 such days during winter. The prevailing winds during the latter period (winter) come from between N.W. and N.E. (68 days.) There are thus sea winds during summer, land winds during winter, but the former are the most distinctly marked.

The results for Launceston sufficiently prove the great preponderance of westerly winds there.

At Hobart Town there are sea breezes from October to April, setting in about noon, and increasing in strength till 5 p.m. (The direction is not mentioned—probably from East or S.E.) A land wind springs up from the N.W. about 10 p.m., and blows a moderate breeze throughout the night, giving away to the sea breeze between 8 a.m. and noon. During the winter months, the great westerly winds of these latitudes are felt. Their character and course are much the same as has already been described. (Comr. Ray, Trans. Roy. Soc. of V.D.L., 1851, p. 148.) It is to be noticed that "a N.E. wind, if it continues to blow for a few hours invariably brings rain."

Turning now to the interior of the S.E. portion of Australia it is extremely interesting to enquire what winds there prevail. Capt. Sturt's journals are distinct on this point; he says, "From December 1844 to the end of April of the following year, the prevailing winds were from E.N.E. to E.S.E., after which month they were variable, but westerly winds predominate. The south wind was always cold and was invariably indicated by the rise of the barometer. (Central Aus., ii. 125.)

These remarks refer to the level country on the east or north of Lake Torrens. We might indeed infer the general direction of the wind from the great ridges of sand which run with almost perfect parallelism over a great track of country, only verging in direction from north 18° west, to north 6° east, in a distance of 50 miles.—(Sturt's Central Australia, I., 381.) These ridges are but solid immoveable waves of sand, produced by precisely the same mechanical action as sea waves, such for instance as the great S.W. ground-swell, which beats upon the coast. It seems likely then that the furthest interior parts of this continent get visited, (lat. 26° to 31° South,) an easterly wind during summer alternates with a westerly one during winter.

In the interior parts of Victoria and New South Wales S.W. winds have left abundant marks of their force. On the plains of the Lachlan "every blade (of parched and dead grass) drooped towards the N. E., and shewed plainly how prevalent the S.W. winds were on these open wastes."—(Mitchell's Three Expeditions, II., 49.) Lakes also are described by Mitchell (Three Expeditions, II., 35.) and others as leaving cliffs or ridges of drifted sand on the N.E. side, and on this side only, produced by the predominating wind.

On the western side of the Blue Mountain Range, I find proof that the strongest, if not the longest enduring winds come from the S.W. or W., in the fact that trees standing on exposed ridges are stripped on that side and remarkably bent towards the N.E.—(Oxley, 147, 166; Sturt's Two Exped., II., 153). Near the Gwydir River the bend of the trees was from the N.W., (Mitchell's Three Expeditions, I., 70.) Passing now across the Blue Mountains, which form the Eastern barrier of Australia, we reach the Sydney district, concerning which we have correct numerical information in the following table, reduced from 15 years observations at the South Head of Port Jackson.

SYDNEY. Direction of Wind.	Jan.	Feb.	Mar.	April	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
N.—N.E.	9	6	9	5	3	1	2	5	7	10	10	11	78
N.E.—E.	5	5	5	5	2	1	1	3	4	3	4	4	42
E.—S.E.	4	4	4	3	1	1	1	1	3	3	2	4	31
S.E.—S.	10	9	7	6	3	2	2	3	5	8	8	9	72
S.—S.W.	2	2	2	4	6	6	7	5	3	3	2	1	43
S.W.—W.	0	1	2	4	10	12	10	7	2	1	1	0	50
W.—N.W.	0	0	1	2	5	5	6	5	4	2	2	1	33
N.W.—N.	1	1	1	1	1	2	2	2	2	1	1	1	16

We find then in Sydney, during the winter months, (May to October inclusive) a marked prevalence of winds between south and west (72 days), but these winds vary as far as N.W. and S.E. thus occupying 50 days more. As every resident of Sydney knows the winter here, is distinguished by cool dry westerly winds, occasioning cloudless and agreeable weather. Often they acquire the forces of a steady gale, becoming then often more westerly or on the other hand reversing to south and southeast and bringing much rain. It may then veer round through E. and W.E., but quickly returns to the S.W. which is the only permanent quarter.

During the summer this is entirely inverted, 50 days are then occupied by winds from the N.E., 49 days by winds from south or S.E., but the only permanent and fair weather quarter is the N.E. Summer mornings are nsually calm and hot until 10 or 11 a.m. when a gentle N.E. sea-breeze is first felt. This possesses a refreshing coolness and attains its greatest force, seldom more than that of a moderate breeze, about 4 or 5 p.m., usually dying away before 8 p.m., but on hot days lasting occasionally till midnight. The alternatively land breeze during the night is but slight.

I have already described the hot winds or thunderstorms which occur when the N.E. breeze is superseded by a N.W. current. After such a disturbance, a south wind invariably follows and gradually veers to the east, the few days thus occupied forming the rainy period. Rain but seldom comes from the N.E. quarter. Gales may occur in summer between the S.S.W. and east.

It is obvious from the numerical results (152) that the above remarks apply almost as well to Port Macquarie or to Sydney except that during the summer S.E. winds predominate slightly over N.E. sea breezes.

Crossing now to Norfolk Island we see by the table (152) that the prevailing aerial current is during the winter, still from the S.W. (50 days). North winds are also pretty frequent. During summer there is a marked preponderance of winds between south and N.E., especially at S.E., showing doubtless the influence of the S.E. trades.

For New Zealand, I have not any good numerical data but from the *New Zealand Pilot* (appendix) I derive the following information. The prevailing winds on the entire western coasts are from N.W. to S.W. During the winter months the general wind over the whole of New Zealand seems also to be from the same quarter. On most part of the eastern coast there is during summer a decided N.E. sea-breeze which sets in about 10 a.m. and gradually dies away towards sunset, when it is succeeded by a westerly or land wind. But, in fact, alternating sea and land breezes will pretty surely be felt during summer near every part of the New Zealand shores when other winds do not over-power them. Among such disturbing winds, the N.E. gale or "black north-easter" is the most peculiar. It is felt chiefly in the North Island, comes on with a leaden-coloured rainy sky and invariably shifts to the north N.W. veering afterwards to W.S.W. S.E. gales also occur from time to time being most felt on the southern and eastern coast and during the winter months, they are accompanied by rain and thick weather, are preceded by a high barometer and generally veer round by the northward to S.W. It must be noticed, however, that dry and very cold S.E. winds also occur with a clear sky and fine settled weather, continuing for several days and then shifting to S.W.

The coldest and most unpleasant winds are the wet southerly and S.W. gales, most common in Wellington and Canterbury. Early winter is perhaps the calmest season; spring and early summer the most breezy.—(Hursthouse, i., 109) In some parts of New Zealand, especially Cook and Foveaux Straits, strong gales are very common, chiefly from N.W. and S.E., but as they are of local origin, and their violence is in a great measure due to the configuration of the shores, I need not further notice them here.

On the N.E. coast of Australia, extending from a little north of Moreton Bay to Cape York, and lying chiefly within the tropic, the S.E. trade blows pretty regularly, producing sea and land breezes near the shore, with a serene atmosphere. At Cape York the trade commences in the beginning of April and lasts to the middle or end of November.—(Australian Directory, p. 209, quoting Flinders, ii., 283–5.) Dr. Leichhardt, when travelling just within this coast along the Rivers Burdekin and Lynd, mentions easterly or N.E. winds as commonly setting in towards sunset, veering in a northerly direction. A cold S.E. wind commonly succeeded at night.—(Leichhardt, pp. 264, 275.) In the centre of the York Peninsula, he had light easterly and westerly winds, without any great or decided movement of the atmosphere.

Returning now to the west coast of Australia and proceeding north, towards the north-west Cape, we find the N.W. gales common at Swan River becoming less severe, and ceasing about the latitude of Charles Bay. Winds between south and S.W. are still very prevalent. But on rounding the north-west Cape (lat. 22°) the case is changed; the S.W. ground swell is no longer felt, westerly winds are common at all times but become more northly during the period that the N.W. monsoon is blowing within its usual latitudes.

Of the N.W. coast it may be said as a general thing that there are no decided winds, alternating land and sea breezes forming the only atmospheric movement. It is essentially a region of fair weather and calm. The sea breeze comes from the west or N.W.; and a S.E. land breeze is often felt at sunrise. The monsoons of the north coast exercise, however, much influence in this region. During the east monsoon (winter), the winds are especially light, and the atmosphere is clear and cloudless. During the westerly monsoon occasional N.W. gales with heavy rains occur. There also the very peculiar hurricane squalls of this coast are met; they happen during the night, blowing very heavily from between E.S.E. and E.W.E. but only lasting one or two hours. Capt. Stokes mentions many of these squalls and says, that they invariably occurred between 9 p.m. and 2 a.m. (ii. 112.)

Coming now to that part which is specially denominated the north coast; viz., the neighbourhood of Port Essington, we are there within the region of distinct monsoons. These extend to latitude 12 south, and blow during winter from an easterly, and during summer from a westerly direction, varying however near shore, much in the manner of sea and land breezes. Thus at Port Essington, during July and August, a south or S.S.E. wind is usually felt at sunrise, bearing to the east in the middle of the day and blowing fresh from the N.E. in the afternoon. The nights are always calm. The winter is the dry season and rain then seldom falls.

From October to April, the westerly winds prevail blowing especially from N.W. and N.N.W., but with less force than the easterly winds; they bring the rainy season, the sky being continually dark and cloudy, and heavy rains or thunder occurring nearly every day.

Having now described, at far greater length than the patience of many readers will bear with, the most distinct winds which are felt in the various quarters of Australia, I have only to take a general view of the whole system. In doing so, I may disregard for the most those alternating sea and land breezes which are felt around every part of the coasts of Australia, from Port Essington to Hobart Town, while stronger winds of more distant origin do not interfere. On the intertropical coasts such regular sea and land breezes would often seem to form the only atmospheric movement according to the frequent statements of seamen and travellers. But often they consist in reality of constant and genial winds disguised and modified. Such is the case with the S.E. trade wind on the N.E. coast.

The wind system of Australasia is composed of three distinct parts. The first, comprising only the most northern extremeties, within about 14 or 15 deg. of South latitude, belongs to the east and and west monsoons of the Malay Archipelago. The second part reaches thence to the Tropic of Capricorn (23½ deg. south lat.,) or perhaps we may better say, to a line drawn from the North Coast Cape to Sandy Cape—the north-east point of Australia. The third, or southerly part, comprising more than half the whole area of Australia and the whole of New Zealand and Tasmania is within the scope of the great constant westerly winds of southern latitudes.

The middle region belongs, or rather would belong if it were not a land surface, to the constant S.E. trades of the Southern hemisphere. These winds blow in a direction almost parallel to the outline of the N.E. coast, which probably causes a deflection during the day, converting the steady S.E. trade into an Easterly or N.E. sea breeze, as observed by Dr. Leichhardt. (p. 154.) On the N.W. coast a S.E. wind would blow direct from the land to the sea, consequently no trade wind, from its inherent nature, is here possible during summer, when the land is heated. There is a total absence of any cause for a strong continued wind, and alternate land and sea breezes often constitute the only atmospheric movement. Captain Stokes states distinctly, that there are few parts of the globe where light winds prevail so much as on the N.W. coast of New Holland, particularly between the latitudes of 13 deg. and 17 deg., and from 100 to 200 miles from land."—(ii. 204.) The N.W. monsoon, however, occasionally extends itself into this region, and brings heavy rains; during winter, the land being colder than the sea, a S.E. wind may prevail to some extent. We have scarcely any information as to the winds which belong to this region, in the interior parts of the country.

During winter we know that a so-called S.E. monsoon or predominant wind blows off the north coast, being felt in the Gulf of Carpentaria and at Port Essington. This may be better described as the S.E. trade wind following the sun into northern latitudes. For when the sun is in a northerly declination and vertical at noon near the Tropic of Cancer, the southerly trade winds would, over an ocean surface, extend themselves to the equator. But during the summer of the southern hemisphere, when the sun is vertical at noon over some part of Northern Australia, the trade winds are removed, for a time, south, and a N.W. current flows on to the sun-heated land from the equatorial seas of India.

The third and southernmost region is that exposed to the sweep of the westerly or south-westerly winds. The northern limit of these is the southern limit of the trade winds, so that in winter a larger portion of Australia is comprised in this region than during the summer. Again, when the sun is in southern latitudes, and the wide flat plains of Australia are fiercely heated, a cause for new and extensive winds arises, which will interfere with or modify the westerly winds. Thus is produced a great movement of the atmosphere from the south and east points of the compass, extending over Victoria, New South Wales, and towards the centre of the continent as far as Sturt penetrated.

These winds rush in towards the central area of Australia in order to fill the partial vacum there produced by the excessive heat, just as a draught sets in towards the lower orifice of a chimney from every part of a chamber. But in those parts of Australia to the westward of the centre, it is evident that such conveying draughts would nearly coincide in direction with the southwesterly winds projected on to the coast by wide and powerful causes which act over the southern oceans. During winter and summer, these southwesterly winds are entirely prevalent at the Swan River settlement, but while in summer they flow into a vacuous heated space demanding a supply of cool air, in the winter they are heaped into a cold and resisting area. Hence probably the heavy rains of winter, and the droughts of summer—as I have shown before this distinction of wet and dry seasons is the less distinctly marked as we proceed eastward to Victoria and Tasmania, because here an opposing wind arises during summer and brings rain. Lastly in the east coast especially to the eastward of the Banier Range, the conditions are inverted. The land wind which would naturally set towards the ocean during winter here coincides in direction with the westerly winds of other parts;

hence the force and predominance of the winter westerly winds at Sydney. But during summer such a wind brings the fierce heat and the rarefied air of the interior to the coast and a sea wind soon rushes in and replaces it; such is the cause of the "southerly" of Sydney.

The fair weather wind at Sydney and the greater part of the east coast comes from the N.E. which is the only settled quarter. It is felt in the manner of a daily sea breeze lulling at night. Now, as the coast and the mountain ranges trend about N.N.E., a simple sea breeze should come from the E.S.E., but at S.E. and E.S.E. gales and rainy weather may always be looked for. The trade winds must extend during summer almost to the latitude of Sydney and they would come from the S.E. It is therefore extremely difficult to explain why the only settled fair weather wind is that from the N.E., although it appears to be but a local effect we must look to some wide acting cause.

One interesting and universal fact concerning the winds of the east-coast, is that whenever the atmosphere is moving in two distinct strata, the upper current is always from some westerly point. During 3½ years of close observation, I do not think that I have noticed for more than some half-dozen times, cirrose or cirrostratose clouds moving from any easterly point. Cirro-cumuli, cirroid, and other lofty clouds will also surely move from the west. To the same point is the certain fact that along the whole range of the eastern-coast (123) thunder-clouds (of the larger kind) come over from the west and move to leeward.

The Weather—I have attempted by means of appropriate short Symbols to keep an exact registry of the state or feeling of the weather, or of the occurrence of striking atmospheric appearances. The following table contains the principal results,—shewing the total numbers of times when the Symbol was marked down at the 2-diurnal observations:—

	Symbol.	Description of Weather, &c.	Spring.	Summer.	Autumn.	Winter.
Summer. Dec. Jan. Feb.	*cu.*	Cumulose clouds	108	119	104	89
	c.	Close clouds, without rain (chiefly cumuli)	67	118	55	46
	x	Black stormy clouds	28	32	26	16
	scd.	Scud, loose low wild cloud	13	21	17	11
	st.	Thunderstorm	15	17	6	4
	s.	Sultry, or hot and moist air	11	19	11	0
	dp.	Air peculiarly damp	4	8	6	3
	c/c	Varying currents in atmosphere	17	17	10	3
	sr.	Small drizzling rain	11	27	15	11
Autumn. Mar. April. May.	*p.*	Pleasant cheerful weather	157	140	259	199
	tc.	Clouds threatening rain	51	55	74	52
	g.	Overcast gloomy weather	23	19	35	23
	d.	Dew	42	9	71	66
Winter. June. July. Aug.	O	Sky quite cloudless	63	49	62	89
	m.	Mist	25	2	27	45
	ci.	Cirrose clouds visible	16	14	20	23
	ha.	Ordinary halo	10	5	5	19
	pr.	Passing rain, showers	14	10	31	32
	lk.	Stationary bank of clouds	12	6	9	22
Spring. Sep. Oct. Nov.	*gl.*	Gale of wind	44	27	8	21
	ht.	Air peculiarly warm or hot	31	26	2	6
	q.	Squall ("southerly")	22	17	6	0
	sl.	Sheet lightning, visible	33	27	23	23
	v.	Veil of cloud, uniform and hazy	37	18	23	33
Solstitial	*bz.*	Breeze, moderate wind	61	68	60	69
Equi-noctial.	*r.*	Rain, steady and moderate	45	32	46	30
	lr.	Rain, in very large drops	10	2	11	5
	ci-st.	Cirrostratose cloud	35	26	34	32

It will be seen that the above phenomena are arranged in five classes according as they occur, most frequently in the Summer, Autum, Winter, or Spring, while the last four predominate at two opposite periods of the year.

I can recommend the above series of symbols to those who desire to record the state of the weather

as should always be done in conjunction with a register of the barometer or other instruments. I should state also that there is a much shorter code of symbols recognised among nautical men, and many meteorologists which affords however, but feeble means of description. It will be found in most books on the subject as for instance, in the Admiralty Manual of Scientific Enquiry.

Count Strzelecki also in his physical account of New South Wales (p. 163) gives a very interesting table, showing the numbers of days in each month for four years, that a distinct upper current was observed in the atmosphere. The results are very uniform and are here abridged.

Winter.	Contrary Current.	Summer.	Contrary Current.
April	11 days.	October	23 days,
May	9 „	November	23 „
June	4 „	December	25 „
July	4 „	January	25 „
August	11 „	February	24 „
September	13 „	March	25 „

It may perhaps be noticed that in the preceding account of the winds of Australasia, I have said nothing of the prevailing theories of rotatory winds. Since it was proved that the hurricanes of the West Indies and of the Indian Ocean are immense whirlwinds, it has become usual to consider almost every gale as a cyclone more or less. Mr. Piddington (Horn-book of Storms, pp. 42—44), has suggested that the gales of Western Australia are cyclones, moving from various directions, and Mr. Dobson of Hobart Town has attempted to prove this in other instances. (Proc. Roy. Soc., V.D.L., 1852), but I think without success. That the wind veers round in the direction —N. W. S. E.— seems an almost invariable rule in Australia, it is in accordance with what is known as Dove's law of veering, and is due to the rotation of the earth. That winds almost always blow in wide curves must certainly be allowed, and it is probable that these curves or quasi—cyclones in extratropical latitudes are in continual progress from west to east. Capt. Fitzroy, has in a recent paper to the Royal Geographical Society placed this subject in a veryreasonable light.

It may be laid down as a philosophical rule that any *law* observable in a series of phenomena, that is any *condition* which constantly or usually attends them, or any circumstance, however trivial, which often occurs in conjunction with them, will probably prove to be connected more or less directly with the efficient cause of such phenomena, and will therefore assist in its discovery. This connection is often indeed evident in the above table ; thus dews and mists predominate in autumn and winter, clear skies in winter and spring, sultry weather in summer and so on. In other cases, however, the meteorologist will find room for the exercise of ingenious conjective but should remember that meteorology is a most complicated problem, a complete chain or rather network of causes and effects. Many instances illustrate this ;—Cloudless skies are necessary to the production of dew and occur chiefly in winter and spring and summer ; a moist state of the air is also necessary which by the proper hygrometical tables will be seen to exist in autum ; hence dew is most frequent in autumn and winter ; thunderstorms (th), sultry air (s) and " varying currents in the atmosphere" (c/c) all predominate in the summer months, and are doubtless correlative. Halos (ha) are thought to be produced by clouds of ice-particles and are therefore most frequent in winter ; I may also state that they are less brilliant and interesting here than in England, in accordance with the probable law of their diminution from the arctic to the equatorial regions. For other speculations which suggest themselves there is not space here.

W. S. JEVONS.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

XXVth MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange.

Tuesday, February 1st, 1859.

Members of Council present :—Messrs. H. C. Burnell, P. L. C. Shepherd, and Captain Ward.

Mr. H. C. Burnell in the Chair.

MINUTES.

Minutes of last meeting read and confirmed.

PAPER READ.

A discussion arose as to the propriety of reading any papers on account of the thinness of the meeting, caused by the severe inclemency of the weather. Mr. Ledger, however, expressing a wish to go on with the reading of his paper, the meeting ruled that the same should be proceeded with.

Mr. Ledger read a continuation of his paper giving an account of the Llama and Alpaca, with notes of a journey from the Bolivian and Argentine Provinces into Chile with a flock of these animals.

Mr. Ledger in answer to a question from Dr. Douglas, stated that the flock had produced 39 young since their depasturing at Liverpool.

It was resolved on the motion of Dr. Douglas, seconded by Mr. P. L. C. Shepherd, that the thanks of the Society be accorded to Mr. Ledger, for his valuable paper, which on being put to the meeting, was carried by acclamation.

MEMBERS CONFIRMED.

The gentlemen proposed at the last meeting were confirmed as members.

PAPERS FOR NEXT MONTH.

Continuation of Mr. Charles Ledger's paper on the Llama and Alpaca.

An account of an experiment of Stall feeding, by his Excellency the Governor-General. "How to Enrich the Grape" and Harrowing the Ground, from Mr. G. Melvoorn.

The next monthly meeting will be held on Tuesday evening, 1st March, 1859.

AN ACCOUNT OF THE LLAMA AND ALPACA WITH NOTES OF A JOURNEY FROM THE BOLIVIAN AND ARGENTINE PROVINCES INTO CHILI WITH A FLOCK OF THESE ANIMALS,

By Charles Ledger, Esq.

(Continued from our last.)

1852.—In February, I entered into arrangements with a Mr. Blondel, of Tacna, to carry out the undertaking, and on 5th March left Tacna for Chulluncayani, the estate that I still held, so as to take measures for at once putting in motion a part, at least, of the Alpacas that I then possessed. On 20th, under pretext for collecting Alpaca wool, in company with a Mr. G. Carroll and two servants, I left Chulluncayani on an exploring expedition as far as the table of Pampa Ullagas situated in the Province of Carangas, Dep. of Oruro and distant 140 leagues. On my return, I was compelled to take quite a different route going north some 150 leagues, to attend to other business that I then had in connection with the aforesaid Mr. Blondel. Mr. Carroll remained behind attending to the Alpacas, as also receiving other lots that I had contracted with the Indians for, round about in a circumference of 20 leagues. I was detained on the Peru Bolivian frontier until September, at the end of that month, I returned to Chullencayni and found that only 83 Alpacas had been added to those I formerly possessed. As nothing could be done, to the putting in motion of the animals until December, as only in that month does the new pasture begin to appear renders the roads or slopes of the andes fit for driving animals. I determined to return to Tacna and find means for making a hasty trip to New South Wales so as to assure myself that the country, I was so desirous of introducing the animal into, was one adapted, not only for the preservation of those that I might succeed in landing, but also for their propagation. On 6th December, 1852, I proceeded to Valparaiso per mail St. "Quito" and found on my arrival there, that the "Dolores" whose prompt departure I had seen announced in the papers for Port Phillip, was still at anchor in the Bay. I took passage and on 24th of same month, at 11 p.m., sailed for Port Phillip. On 2nd Feb. 1853, we anchored in the harbour of Tahiti having been obliged to put in there for water and fresh provisions, leaving again on the 9th, we were again compelled to deviate from our course and anchor in Twofold Bay, on the 18th of March. The 19th and 20th I employed, riding round about the country, going not more, however, than 12 leagues inwards; this was quite enough, both myself, and the party I brought with me, a Peruvian gentlemen, and more versed than I, as to the pastoral necessities of the Alpacas, being quite satisfied that the country was most admirably adapted for that animal. On 21st, I left the "Dolores" and took passage for Sydney in the "Esther Arthur" arriving here on the 22nd. Had the engagements I entered into ere leaving the coast of South America been carried out, long ere this, the Alpacas ought to have arrived here; suffice to say, that in lieu of Mr. Blondel, even after chartering vessels, doing his part, and which by contract in my possession he engaged *to do*, he actually wrote me, that not only would he *not* fulfil his engagement, but that he would divulge my intentions to the Peruvian Government if I persisted in carrying them out.

During my stay in Sydney I obtained all the information that I required, and I became more and more satisfied as to the adaptibility of the country for successfully rearing the Llama species; a country so eminently pastoral as this is could only offer one obstacle to satisfy myself as to that was the real object of my coming, I refer to the climate—it is a well known fact that the Alpacas does not thrive in England or Scotland and the reason for not doing so, I solely attribute to the *humidity* of the climate; here, as in South America, the climate is dry, it matters not how much rain may fall, even for eight days consecutively, the rarity of the air is not affected by it—there may be and no doubt, there is, a difference in the atmosphere immediately before and after heavy rains, yet I contend that no difference exists in the rarity of the air.

To T. S. Mort and Henry Moore, Esqrs., I was much indebted for very valuable information and assistance afforded to me during my stay here, the latter gentleman has from the commencement of this undertaking showed a lively solicitude, and greatly exerted himself in my favor; the former, I am sorry to say, I have not had the pleasure to meet here, but sincerely hope that 'ere I again leave these shores he will return from England with renewed health and strength. On 21st May, 1853, I sailed from hence in the "Fortune," and after a pleasant passage of 43 days, arrived at Valparaiso. At Valparaiso I found many letters awaiting my arrival, yet little or no news respecting my animals. The only thing positive was, that they had moved from Chulluncayani about the middle of January, Peru was then at war with Bolivia. Every attention of the government of the latter republic would naturally be called to its northern frontier, leaving the southern one, through which I must pass with my flocks, without troops, and comparatively speaking, open for me. As this circumstance I considered of the greatest importance, and as my connection with Mr. Blondel had become null and void, I immediately entered into fresh arrangements with Messrs. Boardman, Dickson and Co., (with others) for carrying out my project, determining, without delay, to proceed to the Province of Salta, in the Argentine Confederation, and from that side to enter Bolivia and see personally what had become of my animals. To carry out this intention, I sailed for the Port of Caldera on 4th August, arrived there on the 9th, proceeded to Copiapo, the capital, distant from the port 17 leagues, and set about buying mules and everything necessary for my journey across the Cordilleras. As a journey across the Cordillera or the South American Alps, and more particularly at that season of the year, the passes not being well open and free from snow before the month of December, is not an every day affair, I will endeavour to give you some faint idea of how it is accomplished. In the first place, I looked out for a guide, whose duty is not only that of shewing the road, but he has also to attend to the baggage

mules, and do everything possible to preserve the latter in good condition, load and unload them, pasture them during the night and do everything in his power to please his master or patron. I was very fortunate in falling in with a very excellent guide named Pedro Cabrera, and another man, Pablo Soza, as general servant to assist the guide to load and unload the mules, make the beds, cook, &c., &c. These two men from that date, September 1853, have been in my employ and at present moment are in charge of the flocks, at Liverpool. After arranging with my famous Pedro, taking his advice as to the possibility of getting over so early in the season, to which question he answered, "that certainly it *was* early, but with good mules it *might* be done" "at any rate we could but try." From that day Pedro commenced purchasing mules, packs, &c., and Pablo the stores, pots, pans, and every thing necessary for our journey. A fellow passenger from Sydney to Valparaiso, Mr. Samuel W. De Blois, became there so desirous of seeing the interior, or part of the interior of South America, previous to proceeding on his journey *via* Panama to Halifax, his home, and as I could not desire a better companion in so solitary a journey, you can imagine with what pleasure I listened to his proposal of accompanying me, at his own expense in my perilous trip. I pointed out to him the hardships that he would have to endure, but all that I could say, in lieu of deterring him, only added fuel to the desire he had already expressed.

At 4 p.m. on the 17th September, we left Copiapo, Mr. De Blois, self, Pedro, and Pablo, 12 mules, of these six were saddle, and six pack mules, two horses, with bells to keep the mules together. Our luggage, provisions, corn for animals, &c. occupied three, ourselves for saddle, four mules, consequently we had five spare ones against what might happen, without counting the horses. We had a beautiful moonlight night, travelled the whole of it, arriving the next morning, 10 a.m., at Paipote, distance 25 leagues or 75 miles from Copiapo, the road being a gradual rise of nearly 4000 feet. At Paipote, there is a shed, inhabited by a solitary individual, who collects a toll of 6d. on every head of cattle that passes this road, and as a great number in the summer months pass down to Copiapo. I suppose he manages to make something, after deducting the expenses of keeping the road in some sort of order or repair; here we obtained a little dry lucerne for our animals, and found plenty of water and fuel. We stopped here all the next day, getting our "traps" in order, putting on fresh shoes that some of the mules had lost coming up. The cold then began to be felt, the water being frozen until 10 a.m. We had been detained in Copiapo 10 days, by every body assuring us that it was next to madness, the attempting to cross the Cordellera before October, here we heard again the same story.

20th. Started off at 8 a.m., arriving at Maricurega 4 p.m., distance 12 leagues—plenty of wood and water the whole day—a gradual ascent of about 2500 feet. Here there are no habitations, and as the wind was very high we could not pitch our tent.

21st. The wind on the Cordilleras roaring terrifically we thought it prudent to remain where we were that day. Here we had plenty of fuel, no small consolation when our thermometer at 11 a.m. marked 29 deg. or 1 below freezing point.

22nd. The Guide wished to remain another day—the wind nothing abated; my anxiety to get along being great, I ordered the mules to be brought, and at 10 a.m. got off, taking with us two mule-loads of wood for fuel, as not a chip is to be met with in the Cordilleras; after travelling 6 leagues all the road up hill, rising some 2500 feet, we were forced to bring up, the drift snow preventing the mules making head against it, we luckily fell in with a large rock, and underneath its lee lighted our fire, made the beds and here rested for the night.

23rd. The wind has abated during the night and the morning opened serene and fine, not a cloud to be seen in the azure sky—one of the horses frozen to death during the night. After taking a little hot tea we got away by 7 o'clock. For about one league we continued to ascend, at least another 1000 feet, by 9 we had ascended to the highest part of the pass and suddenly opened to our view a most magnificent and grand sight, as far as the eye could reach, one immense plain of snow, intersected here and there with high mountains that are covered with perpetual snow. Along the road the snow was not above 6 inches deep, except here and there, where the drift had accumulated in some undulation. About 12 our baggage mules got into one of these drifts; one broke its back in endeavouring to extricate itself; we had to unload the whole of them, carry the baggage by hand out again, re-load, send Pedro on a-head to explore, and in this manner travel the whole day. As the sun had been warm during the afternoon a great deal of the snow had melted, and when we arrived by 6 p.m. at Patos, here and there some patches of the thick rank grass of the Cordillera were visible. At this hour it was again freezing hard, but there being no wind we could pitch our small tent that protected us from the intense cold. This day we had travelled about 13 leagues.

24th. Started this morning at 4 a.m.; the cold very severe, but as this day's journey is a long one we determined to suffer it and get along. One mule we were forced to leave behind, it was so lame that it could hardly move; of course it must have perished; not so much snow as yesterday; the very many steep hills makes this day's journey extremely trying to the animals. Solitary deserted, silent wastes; here and there we fell in with crosses, denoting where some unfortunate traveller had perished. A large heap of bones, those of man, mingled with those of beast, shewed us where 15 men and 30 mules perished two years before; another where 3 men were struck dead by lightning, and the whole road is clearly marked by the skeletons of mules, oxen and donkeys. Yearly, many human beings perish in these inhospitable regions, the greater part of whom are drovers of cattle returning from Copiapo to the valleys of the Argentine Provinces. Sometimes a snowstorm accompanied by hurricanes of wind overtakes the droves of cattle in their journey (even in the middle of summer) to Chile, such happened to Dr. Manuel Cornejo with 800 head of cattle, every head perished; he with his drovers escaped, each of them however, lost a hand, foot, nose, or ears, by being frost bitten. In 1855, Messrs. Aguire and Aranjo with 12 men perished in the snow, and when their remains were found, the greater part of their bodies, the packs, bedding, &c., had been eat by their own mules—the dead mules were found not far from their owner's remains. More than once, I have been much annoyed and suffered severe bites from my mules, pressed by hunger, at night, coming around our beds and biting at the clothes. I have repeatedly seen mules eat dry hide, gunny and cotton bags with avidity.—25 leagues this day.

25th. Started at 6 a.m., I this morning at 10, got out our thermometer and found it making 24 or 6 degrees below freezing point—by 12, we had

ascended some 1,500 feet, and being then at the highest ridge of the Cordilleras 12,000 feet, commenced a gradual descent arriving by 5 o'clock at the "Cazadero" a fine large swamp, we were now out of danger and as the afternoon was very fine we got out our guns, shot several fine ducks, that afforded us an excellent supper—we here found fine pasture for our all but exhausted mules, which, for the last three days, we had only been able to give a little barley morning and evening to; we fell in with plenty of fuel, and over a large fire conversed about our lucky passage of the terrible Cordilleras; had we encountered wind in the middle thereof our position would have been one in nowise enviable.—13 leagues this day.

26th. Started at 8 a.m., after a hearty breakfast—going about 5 leagues of deep sandy up-hill road, we found pasture, water, and fuel in abundance. This day the wind was "tremendous," at one time we could hardly keep our mules head on, the sand all but blinded them and us, and the pebbles beating against us annoying in the extreme. At 5 p.m. we arrived at a watering place called "Apucanga," and there put up for the night. We met here three men, who four days previous had been forced to relinquish their attempt to cross into Chile, all were much frost-bitten; one had already lost a foot that had snapped off at the ancle, the other foot was in a very bad state; all that I could do for them was to dress their wounds with "Holloway's" ointment, I left them a pot, and had the pleasure of afterwards hearing that they fully recovered with no further loss of joints. During the whole of my travels I always had with me a quantity of this invaluable ointment, which with the pills I have freely administered for almost every disease, wounds, &c., and I willingly bear testimony to its efficacy and invaluable properties.—12 leagues this day.

27th. Got away from our encampment about 9 a.m., and about 2 in the afternoon arrived at the village of Saujil. Here we came across the first vegetation of the Argentine Province of Catamarca. Saujil is a small scattered village, comprising the residences of muleteers and cattle dealers with Copiapo. Vegetation is abundant, but every thing is left to nature; little indeed has the hand of man done to advance the abunddance that here reigns paramount. Our arrival created no small sensation, the inhabitants could hardly believe any person so adventurous as to attempt the "passes" so early in the season. We gave information respecting our frost-bitten companions of the night before, and steps were immediately taken for having them brought into the village. We remained at Saujil refreshing our animals 9 days, bought 3 more mules, and on the 7th of October, proceeded on our journey to Salta, passing through the picturesque little villages of Londres, Belen, Santa Maria, Hualfin, Tolombon, and Cafayete, in all of which we received the greatest hospitality from the inhabitants, who seemed delighted with the interest we took in their vineyards, orchards, and cattle paddocks, arriving on the 12th at Molinos, a village containing some 1000 inhabitants, and distant from Salta 40 leagues. At Molinos we were invited to the house of Don Romano Cruz (Cross) son of an Englishman, who was Sergeant of Cavalry in the army of General Beresford, that invaded Buenos Ayres in 1805. In Mr. Cross' house we met with a countryman, by name James Johnson, from Cheshire, he was taken prisoner when the English were defeated at Buenos Ayres in 1807. He, with several others were sent into the Province of the Interior, had remained there ever since; he had formerly been a sailor and served under Lord Nelson; he had almost forgotton his native tongue, and not acquired great fluency in Spanish; he was delighted to see us, said that he had not spoke to an Englishman for 15 years—could not allow that any other, than the daughter of the "Great Nelson" could be Queen of England, he possessed a small patch of ground, cultivated sufficient for his limited wants, was respected by all the inhabitants, and died in 1854, aged, I should say, 75 years at least.

In Molinos I left all the mules, hired others, and on the 14th, again moved on—that evening we stopped at the "Churcal" estate of Dr. Bernardo Gonstiaga and from that date, I enjoyed the friendship of this gentleman until finally leaving those hospital valleys on 9th February, 1858. Dr. Bernardo was indeed a true friend, many times, I know not what I should have done without his generous and most disinterested assistance. On the 16th, we arrived at Salta, distant from Copiapo 240 leagues, and put up at the house of a very old friend, Senor Cornejo, who I had known since 1840. The city of Salta contains about 10,000 inhabitants, and here resides the Governor of the Province of some name. The principal inhabitants are employed in the cultivation of the many large estates that surround the city and extend to the limits of the Province. To the north, the Province of Jujuy, south the Province of Tucuman, east the desert of the "Chaco" and west the Republic of Bolivia.

Many are wholesale and retail dealers in European manufactured goods, making their purchases in Buenos Ayres and Valparaiso. The latter market appears to command much more attention than the former. The consumption of manufactured goods may be estimated at nearly 2,000,000 dols. annually; the population of the Province is not more than 90,000, the principal purchasers are from the south of Bolivia—

The exports are 60,000 bullocks, Chile, Bolivia, and Peru; 40,000 marks or 20,000 lbs. weight silver 30,000 mules, 30,000 ozs. gold, 8,000 donkeys; and 20,000 tanned hides to Buenos Ayres. The former is smuggled from Bolivia and sold in Salta.

The Plaza is a fine large square but not kept in order, being full of weeds and grass with a cow or so grazing thereon—the police extremely negligent as to cleanliness. The Churches only call attention by the dilapidated state in which they are. There are several fine private residences, but there is not a single public building of note.

22nd. Having bought two fresh mules for Pedro, I despatched him by way of Santa Catalina into Bolivia to look after the alpacas, with orders to join me at San Cristobal, in the Province of Lipes. My companion Mr. De Blois being desirous to return to the coast, I determined to accompany him part of the way so as to personally inspect the "upper" road to Copiapo, as I found that the road by which we went to Salta would hardly do for the alpacas.

On 28th, we again started for Molinos, arrived there on the 30th, found our mules in good condition, and set about making preparations for Mr. De Blois' journey to Copiapo and mine to San Cristoval, the latter being one of some 250 leagues. I purchased 5 mules and 1 horse for self, and selected the best of the other mules formerly left at Molinos, for Mr. De Blois.

On 1st October having finished shoeing our animals, I sent on to Autofagasta with Manuel, another servant engaged at Molinos, six animals,

with orders for him to await there my arrival. On 3rd left Molinos with Mr. De Blois and three men; arrived on 7th at Larga Blanca, and 8th said good bye to my friend De Blois, who started that day for Copiapo and Valparaiso; I availed myself of this opportunity, and wrote to Messrs. B. Dickson and Co., informing them that up to date I could obtain no positive information as to the whereabouts of my flocks, advising them at same time of the measures taken, and my intentions, ordering them to forward money for my account to Salta, so as to be ready when required. The next day I started for Autofagasta with Pablo Joza, and a guide obtained at Larga Blanca; on the 11th arrived there, found Manuel awaiting my arrival; left the mules brought with me and proceeded on with those sent from Molinos; after 11 days hard riding through a country totally unprovided with the necessaries of life, I arrived at San Cristoval; the day after, Pedro there met me, and from him I obtained the welcome information that the flocks were distant from us about 60 leagues. The next day again in motion, and three days afterwards fell in with the two advanced flocks, the third was yet behind some 8 leagues. Stopping a couple of days with the former, I hurried to meet the latter, and three days after assembled all together. The flock now comprised 312, the remainder of 450 that the January previous had started. As no time could be lost, I immediately despatched four of my Indians in different directions to purchase more, and commenced gently driving the others in two flocks towards the Argentine frontier. Up to this date I met with no further molestation than what from time to time the congregating together of 30 or 40 Indians, who only menaced to take the animals from me, or made enquiries as to where I intended taking them. No authority intervened, and I had too many men about me to fear that force would be appealed to. In the beginning of January, 1854, three of the Indians that I sent to purchase more alpacas, returned to me with 160; the fourth did not return himself, but sent back the money, assuring me that he could not obtain a single one, the owners refusing to sell. It now became necessary for my proceeding to Salta, to receive the money that I expected Messrs. Boardman, Dickson and Co., would have placed there for me. On my arrival, some eight days afterwards, I found that they, in lieu of sending funds, had determined to relinquish participation in the speculation, fearing that it would be too long an affair and too fraught with risk to suit them. Without trepidation, I immediately determined on proceeding to Valparaiso, and incredible as it may appear, I accomplished the distance—240 leagues, or 720 miles—in nine days. I arrived just in time to catch the steamer passing Caldera for Valparaiso on the 10th February, and arrived in Valparaiso on the 12th. Since leaving Copiapo on the 17th September, 1853, I had gone over more than 3000 miles on mule back.

Finding that Messrs. Boardman, Dickson, and Co., were determined to have nothing more to do with the speculation, I soon came to terms with Messrs. Waddington, Templeman, and Co., for carrying out the undertaking. On 15th March I was again in Copiapo; occupied several days in examining the different roads to the "Old Fort," Puerto Ingèls, and finally determined on Caldera, as the most eligible one for embarking the animals. If September was too early for crossing the Cordillera, April was nearly too late; I had been detained a few days in Copiapo by indisposition. On April the 3rd, I again left Copiapo behind, and recommenced the passage of the Cordillera, taking this time another route, so as to satisfy myself as to which would be the best for bringing the animals across. After a most tempestuous journey, the winds and storms being terrific, I succeeded in getting to Molinos in 13 days, with my hands and feet frost-bitten; Pablo was left without hopes of recovery, in charge of some muleteers going to the valleys of Catamarca, who promised to carry him dead or alive to the house of my good friend Comandante Don Miguel Pereira, to whom I wrote a few lines in pencil, requesting him to shew him every care on my account, and when convalescent to forward him to Salta or Molinos. They (the muleteers) got him to Saujil, distant from where I had to leave him about 60 leagues; he had had a very severe attack of small pox, and some three months after again joined me on the frontier of Bolivia, with all the mules that I had previously sent to Saujil.

I was incapable of mounting my mule for nearly twelve days, within that time I again got away to join the flocks taking the direction that I thought to meet them in. After wandering some 25 days among the uninhabited heights of the Bolivian frontier, sleeping in the open air, and often without fuel for a fire, with now and then meeting some solitary vicuna hunter, I got to the small town of the "Rinconada" and there got news that in lieu of the flocks having taken a southerly course as directed by me before leaving them in January, the very severe snow storms had compelled them to take a north-easterly one to save themselves and the animals from total destruction.

Every one of the lambs, nearly 200 born that season, and 184 of the large ones had perished during my absence and many of the Indians had run away fearing that I should attribute blame to them for losses in no ways owing to negligence or in their power to avoid. I found the poor men then in charge, without anything more to eat than the half putrid carcases of the many dead animals that surrounded them. And some Coca leaves, the virtues of which I explained in my former paper. To despair was never for a moment to be thought of, I had brought with me provisions for twenty men for at least six months, and sheep could be obtained some twenty leagues off. To get some, I started off myself and one man the next morning at day break; four days afterwards I returned with 50 sheep that I contrived to purchase, at $1 each. As the roads were now totally unfit for travelling, all that I could do until next season was to get the animals into some more protected spot, and out of Bolivian Territory, this I effected on 18th May. This accomplished, I made up my mind to return to Molinos and from thence devise means for sending an express to Copiapo, communicating the disaster to Messrs. Waddington, Templeman, and Co., In Molinos I could find no one inclined to dare the passage of the Cordillera, and seeing my anxiety, Pedro volunteered to try and force a passage.

(To be continued.)

HINTS ON THE MODE OF EXTINGUISHING FIRES, BY JAMES BRAIDWOOD, ESQ., SUPERINTENDENT LONDON FIRE BRIGADE.

"Some years ago, upwards of £100,000 were lost through the partner of a large concern lighting gas with a piece of paper, which he threw away, and thus set fire to the premises, although it was a strict rule in the place that gas should only be lighted with tapers, which were provided for that purpose. In one department of a great public institution, it was and is still a rule that

only covered lights should be carried about, and for that purpose four lanterns were provided; yet on inquiry, some time back, it was found that only one was entire, the other three being broken —one having lost two sides and the top; still they were all used as covered lights.

"The opportunities for inattention to fires and lights are so various, that it is impossible to notice the whole. Incautiously approaching window and bed curtains with a light, and airing linen before the fire, are almost daily causes of fire in London, and some of the most distressing cases of loss of life have originated from these and similar causes. Children playing with fire is also another constant cause of fire and frequent loss of life. The dresses of females taking fire adds very much to the list of lives lost by fire, if it does not exceed all the other causes put together. Taking off the burning coals from a fire, and laying them on the hearth, also causes fires occasionally. Reading in bed by candle light is another source of the same evil. A very serious annual loss is also caused by want of due care in hanging up or removing the goods in linen drapers' shop windows when the gas is burning. Flues taking fire often result in mischief, and it is believed that many serious fires have arisen from this cause, which can hardly be called accidental, as, if flues are properly constructed, kept moderately clean, and fairly used, they cannot take fire.

From what has been said, it will be seen that care and attention may do a very great deal towards the prevention of fire and consequent loss of life. It is very easy to make good rules, and keep them for a time, after having been alarmed by some serious loss of property or life; but the difficulty is to maintain constant attention to the subject. The most evident plan for effecting this seems to be for the masters thoroughly to examine and consider the subject at certain stated periods, not too far apart, and to constantly warn their domestics, workmen, or others, of the danger of the improper use of fire and lights.

"There is another very common cause of fire, which seems to come under the head of construction, viz., covering up a fire-place, when not in use, with wood, or paper and canvas, &c. The soot falls into the fire-place, either from the flue itself, or from an adjoining one, which communicates with it. A neighbouring chimney takes fire, a spark falls down the blocked-up flue sets fire to the soot in the fire-place, which smoulders till the covering is burned through, and thus sets fire to the premises.

"On the first discovery of a fire, it is of the utmost consequence to shut, and keep shut, all doors, windows, or other openings. It may often be observed, after a house has been on fire, that one floor is comparatively untouched, while those above and below are nearly burned out. This arises from the doors on that particular floor having been shut, and the draught directed elsewhere. If the fire appears at all serious, and there are fire-engines at a reasonable distance, it is best to await their arrival, as many buildings have been lost from opening the doors and attempting to extinguish fires with inadequate means. If no engines are within reach, it is well to keep a hand pump. If that is not to be had, the next best thing is to collect as many buckets out side the room on fire as can be obtained, keeping the door shut; then creep into the room on the hands and knees (if the heat and smoke are considerable), and throw the water as nearly in the direction of the fire as possible, keeping the door shut while more water is being collected. The police of the metropolis understand shutting up fires so well, that they have in many instances kept fires two or three miles distant from the engine stations shut up till the firemen arrived in time to extinguish them."

From our own Correspondent.

Magdalen College, Oxford,
December 10, 1858.

SIR,—The formation of Glaciers and the constitution of ice, have recently been much elucidated by the researches of Professor Tyndal. It has for some time been known to philosophers, that ice, which is in appearance, so perfectly amorphus and quite devoid of any crystalline form, is by no means so simple in its structure as it appears. That it has in reality a constitution like that of crystals. This is shown by the fact that when subjected to pressure, it breaks with most ease in a particular direction, similar to what is called the cleavage of crystals, and that this direction is usually parallel to the surface at which congelation has taken place.

The recent researches of Mr. Tyndal corroborates, and extend these laws. On exposing a plate of ice, an inch think, to the action of a beam of the sun, the passage of the ray was found to be marked by the instantaneous formation of a number of what seemed like air bubbles "of more than metallic brilliancy." On examining the distribution of these *bubbles*, they were found to be in planes parallel to the surface of congelation. A piece of ice thus affected, being examined parallel to the plane of congelation, was found to present a number of flowers, each with six petals, having for its centre a "bubble," similar to those already described. These "flowers" were evidently composed of water, and rendered visible by the difference of refracting power between water and ice. The edges of the petals were at first plain, but shortly became serrated presenting a very beautiful appearance. To ascertain the nature of the "bubbles," a piece of ice was carefully melted in warm water; when the part immediately surrounding the bubble became liquid, it simply disappeared not rising to the top of the water as an air bubble would have done. These then would appear to be simple vacua, caused by the melting of the "flowers" which surround them, since water at 32 deg. takes up, of course, less space than it did as ice. The formation of these liquid flowers shew two important facts,—1st that ice may be melted in particular parts of its interior, by heat which has passed through the exterior parts without melting them;—2nd, that these places are to be found in certain directions, namely in planes parallel to the surface of freezing. This last fact, together with the symmetrical shape of the flowers themselves, shew that the ice has a definite "molecular architecture" as Mr. Tyndal calls it, which is shewn even in the destruction of the fabric by heat. It should be remembered how similar are the forms of snow-crystals. The lines in which it cleaves under pressure are also coincident with these. Mr. Tyndal has also given a new explanation of the constant occurrence of water associated with air bubbles in ice which is, perhaps, too abstruse for insertion here. It depends upon the fact already stated, that heat may melt the interior of ice after passing through the exterior, and also on the difference in specific heat between air and ice.

A very useful discovery has been in analytical chemistry by Mr. Cartmell, in the laboratory of Professor Bunsen, at Heidelberg, which greatly

facilitates the detection of the fixed alkalies. The yellow flame of soda, the violet of potassa, and the red of lithia, have already been used as means of ascertaining their presence, but have been uncertain because the yellow of the first overpowers both the others. Mr. Cartmell has discovered a means of intercepting all the yellow rays caused by soda in a flame which is coloured by that with others, and the red rays caused by lithia in a flame coloured by that and potash. In the former case a solution of sulphate of indigo diluted to the requisite strength is used. A pure soda flame seen through a small flat bottle containing this, appears of a dull pink; a potash flame retains its violet colour unaltered, while in one coloured by both, the soda yellow is completely intercepted, and the violet imparted by the potash seen alone. Potash may similarly be detected in the presence of lithia, by looking at the flame through a screen of cobalt glass, of thickness sufficient to destroy the red colour of a pure lithia flame; the red colour is in this case also destroyed, and the pure violet of the potash seen. No medium has yet been discovered, by which the Potassa and Soda colours can be intercepted, and the latter left. The latter, however, is detected by the flame with that given by a pure Potassa salt. The results given by these processes are singularly accurate. Mr. Cartmel asserts that he can detect one part of Lithia in one thousand of Soda, or 1 of Potassa in the presence of 200 of Soda, and he hoped in this way ultimately to determine the quantities of each alkali present.

An interesting observation in natural history has reached us from Stockholm. A gentleman of that city being on a visit to Iceland, and struck with the neighing sound made by the common snipe when flying, which is well known to naturalists in this country and has often puzzled them to tell how it is made, whether by the wings or throat, has found that the noise proceeds from the tail feathers, and by tying one of these to a stick and whirling it round so as to catch the air, he exactly imitated the sound. Perhaps if Australia contains any snipes, some of your readers may discover a similar habit in them, and be able to repeat the experiment.

METEOROLOGICAL TABLE.

JANUARY, 1859.

OBSERVATORY, SYDNEY, LATITUDE 33·52 SOUTH; LONGITUDE, 151·12 EAST
HEIGHT ABOVE THE SEA, 145 FEET.

Day.	Barometer corrected to 32 deg. Fhnht.		Wind. Direction.		Force.		Temperature. Max.	Min.	Cloud Extent.		Rain in Inches.	Remarks.
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M.	9	9		
1	30·031	29·955	E.	N E.	1	2	76·0	58·1	1	0	...	Fine throughout
2	29·900	·846	E.N.E.	E.N.E.	2	3	75·5	59·5	0	0	...	Fine throughout
3	·910	·844	S.W.	S.	2	3	75·9	60·3	10	10	·005	Shower at 8·30 a.m.
4	·819	·842	S.	E.S.E.	3	1	76·4	63·4	3	7	...	Light shower at 8 p.m.
5	·926	·928	S.S.E.	E.	1	1	76·3	62 4	10	10	·040	Showery from 6·30 a.m.
6	·857	·778	N.W.	N.E.	2	1	72·0	60·6	10	10	·339	
7	·742	·746	E.	N.E.	2	1	75·5	61·6	6	10	...	Light shower at 8 p.m.
8	·744	·644	0	N.	0	1	77·1	65·5	10	10	·009	Heavy rain 1 to 5 p.m. and at night
9	·594	·579	W.N.W.	E.	1	1	93 0	63·4	0	9	1·388	Light Showers in the evening; rain at night
10	·499	·565	N.N.W.	W.N.W.	1	3	81·0	63·3	10	10	·577	Showers : wind changed to W.N.W. 7 p.m.
11	·646	·818	W.S.W.	E.S.E.	3	4	83·5	62·0	0	8	·060	Heavy rain 9·30 p.m.
12	·986	30·065	S.S.W.	S.E.	3	2	81·2	60·6	10	2	·275	9·30 p.m. light shower
13	30·089	·112	S.S.E.	S.E.	2	1	75·4	61·5	7	0	...	Cloudy forenoon; cleared at night
14	·128	·097	S.E.	E.S.E.	3	2	77·8	58·1	7	10	...	Fine throughout
15	·033	29·919	N.E.	N.E.	2	4	74·8	60·8	9	10	·018	Rain 8 a.m ; cloudy day
16	29·819	·713	N.	N.E.	1	3	75 9	67·8	10	9	·012	Showers occasionally
17	·730	·656	N.N.W.	N.E.	3	2	91·6	67·2	0	0	...	Hot day; lightning to S. at 10 p.m.
18	·729	·722	N.N E	N.E.	1	3	98·6	67·8	9	10	...	7 p.m. thunder storm; rain all the evening
19	·759	·868	S.S.E.	S.E.	2	1	78·4	65·7	9	8	·285	Fine
20	·943	·983	E.	S.E.	2	1	74·1	65·6	6	10	·020	Heavy rain in the forenoon
21	30·000	·943	E.	E.N E.	1	3	74·8	61·3	10	10	·695	Showers in the forenoon.
22	29·961	·965	N.E.	N.E.	3	2	74·2	65·8	10	0	·005	Fine throughout
23	·999	·977	N.E.	N.E.	1	3	80·4	60·4	0	0	...	Fine throughout
24	30·039	·989	N.E.	N.E.	3	2	78·0	66·1	2	0	...	Fine; strong wind; fell at night
25	29·957	·811	N.E.	N.E.	2	4	76·3	66·4	8	0	...	Fine; windy day
26	·713	·561	N.E.	N.E.	2	5	76·7	62·9	0	0	...	Fine; windy at night
27	·680	·774	S.S.E.	S.	1	2	76·8	64·7	10	9	·001	Showers in the forenoon
28	·806	.764	S.S.W.	N.E.	1	1	78·6	62·2	2	2	·022	Fine; clouded over at 10 p.m.
29	·698	·671	E.	S.	2	1	78·0	62·3	2	5	...	Thunder showers from 1 p m.
30	·689	·730	S.	S.	3	3	72·4	63·5	10	10	·040	Shower, 8·30 a.m. ; heavy rain in the evening
31	·738	·764	S.E.	S.E.	2	4	69·1	60·0	10	10	3·195	Raining all day.
Mean.	29·844	29·827			1·9	2·3	78·2	62.9	·61	·61	6 986	Days Rain—18.

The Black Bulb Thermometer is now placed about 4 inches from the ground.
The extent of clouds is represented by the number of tenths of the whole sky, obscured at the time of observation.
The force of the wind is represented according to the Observer's judgment, by numbers from 0 to 6, 0 representin a calm, and 6 a violent storm.

HEALTH OF SYDNEY.

Registrar General's Office,

Sydney, 14th February, 1859.

The number of Deaths registered during the month of January, was 143, viz.—87 males and 56 females, 65·08 per cent. being under five years of age. The number of Deaths registered during the corresponding month of previous years, was as follows :—

1857.....143 ; per centage under 5 years.....55·94.
1858.....167 ; do. do. .....61·07.

The number of Births registered during January was 182 viz. :—104 males and 78 females, being 39 in excess of the Deaths.

WARD.	Under 5 Years.			Above 5 Years.			Unspecified.		Grand Total.
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	
1.—Gipps	2	6	8	5	...	5	...	...	13
2.—Bourke*	5	4	9	13	3	16	...	...	25
3.—Brisbane	8	3	11	2	1	3	...	...	14
4.—Macquarie	5	6	11	3	...	3	...	...	14
5.—Cook	8	7	15	3	6	9	...	...	24
6.—Fitz Roy	7	3	10	2	1	3	...	...	13
7.—Phillip†	8	10	18	5	1	6	...	...	24
8.—Denison	8	3	11	3	2	5	...	...	16
Total	51	42	93	36	14	50	...	...	143

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

Summary of Deaths of both Sexes Registered in Sydney, from 1st to 31st January, 1859.

Causes of Death.	Under 1 year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all ages.
Zymotic Diseases. Endemic, Epidemic, and Contagious	13	13	5	1	1	33	3	...	...	...	3	...	1	...	...	2	...	...	...	...	...	...	...	...	...	...	42
Sporadic Diseases. *Of Uncertain Seat*,—Dropsy and other Diseases of variable Seat.	11	1	1	...	...	13	...	...	...	...	...	2	1	...	1	1	1	1	...	1	...	...	...	...	..	...	21
Of Nervous System.—Diseases of the Brain, &c.	12	4	1	...	2	19	...	...	...	1	2	...	2	...	1	...	...	...	1	...	...	...	...	...	...	...	26
Of Respiratory System.—Diseases of the Lungs, &c.	...	5	...	...	...	5	...	...	...	...	...	2	2	2	1	...	1	1	...	...	...	...	...	...	...	...	14
Of Circulatory System.—Disease of the Heart and Blood-vessels	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	2	...	...	...	...	...	...	...	...	4
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	3	15	1	...	...	19	...	...	...	...	1	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	22
Of Urinary Organs.—Diseases of the Kidneys, &c.	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Generative Organs.—Childbirth, Diseases of the Uterus	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Of Integumentary System.—Diseases of the Skin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Old Age	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	2
External Causes.—Violence, Privation, and Intemperance	1	1	1	...	...	3	1	...	..	...	2	...	...	1	1	...	...	...	...	1	...	...	...	...	...	...	9
Unspecified	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Total from all Causes	40	39	10	1	3	93	4	1	...	1	8	5	7	5	4	3	3	4	2	2	...	1	...	..	...	...	143

CHRIS. ROLLESTON, Registrar-General.

THE HORTICULTURAL SOCIETY.

It is a frequent subject of remark in this colony that societies for the promotion either of science or art fail, after an existence of a very few months or years, to sustain the interest with which they commenced. A rather striking exemplification of the truth of this remark is, we regret to say, furnished by the state of the Australian Agricultural and Horticultural Society.

Whether the lack of interest which is observable in its meetings, arises from apathy or from antipathy, we do not venture to say, but it is certain that it exists. The monthly meetings that two years ago used to be fully attended now scarcely command sufficient interest to gather together a dozen members; the last Exhibition that was held in the Government Gardens was a lamentable failure, both in regard to the variety and quality of the articles exhibited and to its pecuniary results.

It would be well, therefore, for the Council to consider whether there is any cause capable of removal, that is operating to the detriment of the Society, and whether there are any stimulants that could be employed to awaken greater activity in this most useful of all pursuits—the cultivation of the soil.

It is proper to recall to mind that the Australian Horticultural Society has strong claims on the gratitude of the colonists. By the publicity which it afforded to the introduction of the *Sorghum saccharatum*, hundreds of small growers have been largely benefitted—there can scarcely be mentioned an instance where a plant has at once taken such a hold on the public attention, and has so largely repaid the zeal and public spirit of the gentlemen to whom the colony is indebted for its introduction.

What has been done with this plant may be achieved by many others, and we were pleased at the Monthly Meeting, held on Monday, April 7th, 1859, to find that the Hon. Mr. Want, who has but recently returned from a visit to Europe, had brought with him information gathered during his travels, calculated to direct attention to a new article of home production, namely, the extraction of oil from the Colza seed.

It is well known that this is a very pure and fine oil for lighting purposes, and as such it fetches a very high price in the English market, being preferred to all others for the finer description of lamps. Mr. Want observed the cultivation of it in Normandy, and finding that very large profits accrued to the farmers, resolved to obtain all the information he could as to its culture, and to bring to this colony a supply of the seed. Both these things have been done, and now the experiment only remains to be tried. It is probable that in a year or two from this time Colza oil will be extensively cultivated, for home consumption, even if it does not prove sufficiently remunerative to export to the English market.

We have used these instances to shew that the Society to which we desire to attract the sympathies of our readers has been already of real advantage to the colony and bids fair to confer still greater boons upon it, and at the same time to stimulate those colonists who may travel in foreign lands, to collect facts respecting the horticulture and agriculture there practised, that may be valuable in our experience.

Now that the vast continent of China is opened to British curiosity it would be desirable that we should endeavour to obtain some of the curious and delicious fruits that come to perfection in that country; we might also, perhaps, civilised as we boast ourselves to be, take a lesson from the patient industry and the manuring economy of the Chinaman, by which alone the vast population of that country can be supported. It should be remembered that the *Sorghum* is originally an introduction from China.

With regard to the Society more especially under notice, an impression appears to prevail, that the practical men—that is the gardeners—do not consider that they have a sufficiently active share in the management. There can be no doubt but that this difficulty, if it exists, would be readily met by the Council, and all those who would work, might find an opportunity for exercising their talents and delighting the public by the periodical displays of their skill.

We cannot omit to mention (not out of any spirit of sycophancy, but as an honest tribute of admiration) the great and steady interest that is manifested in the welfare of the Society by Sir William Denison,

the President. At the Monthly Meetings he is always in his place, and though only half a dozen members may be present, he shews no diminution of attention. Such encouragement on the part of the first individual in the community ought surely to be rewarded with more numerous meetings.

With regard to the future exhibitions of the Society it would be desirable, we think, if greater exertions were made by members of the Council to obtain articles for competition. We are sure that in a great number of cases valuable plants, the property of private gentlemen, have only to be asked for to be lent; and there are many makers of, and dealers in, agricultural implements who would be glad to have an opportunity to exhibit, if the means were only pointed out.

The fact is, the success of the Society depends on the popularity of its exhibitions. Large numbers of the subscribers pay their annual subscription for no other purpose than to obtain admission to them. If these are not attended to, therefore, the Society cannot expect to succeed, and we much fear that two or three more exhibitions like the last will completely extinguish it.

It would be most desirable if we could obtain a class of cottage gardeners to enter as competitors. It is to the people after all that these societies must look for support, and at the present exhibitions the working classes are scarcely ever seen. This is not the case in England. The Spittal Fields weaver is noted for his pinks and his geraniums. In the smaller towns of Lancashire the weavers have their gardens and their societies for the cultivation of plants. It is difficult to see why such a taste should not be aroused here; but we regret to say that we do not remember to have seen a well kept cottage garden ever since we arrived in the colony. Some landlords of our acquaintance have endeavoured to stimulate their tenants to this pursuit by laying out, and even by planting the land attached to their small cottages, but we have always heard that the experiment has failed. Perhaps the enervating character of the climate is one of the causes of this sad neglect; but, in our opinion, the true cause is that the working classes generally are so well off, compared with those at home, that they have not the same strong incentives to industry and thrift.

We cannot, however, hope that the Australian Agricultural and Horticultural Society will obtain any great degree of prosperity until the sympathies of the working classes are enlisted in its favour, and how this should be done ought to form the most serious subject of consideration for the Council of Management.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

On Tuesday evening, March 1st, the Twenty-sixth Monthly Meeting was appointed to be held in the Chamber of Commerce, at the Exchange. His Excellency the Governor-General attended and took the Chair at the usual hour, but in consequence of the very small number of members present, it was deemed best not to proceed with the business of the meeting and those present accordingly dispersed.

AN ACCOUNT OF THE LLAMA AND ALPACA WITH NOTES OF A JOURNEY FROM THE BOLIVIAN AND ARGENTINE PROVINCES INTO CHILI WITH A FLOCK OF THESE ANIMALS,

By Charles Ledger, Esq.

(Continued from our last.)

1854.—On 2nd June, Pedro went off, during his absence I forwarded more provisions, clothing, and other necessaries to the men. I am sorry to say that about this time poor Mr. Carroll committed suicide in Iquique. Pedro returned in July, and brought me intelligence, that Mr. Waddington had gone to England, and had left no other instructions than to prepare the vessel for conveying the animals to Australia, that I must await his return for future instructions.

Having funds with me, I determined to do all in my power to replace the animals that I had had the misfortune to lose. I engaged Don Roman Cruz to make a journey, and endeavour to obtain at least 200; Pedro I also sent away with the same instructions, agreeing to meet them at given places and at stated times.

It was about this period that a report got about that I was a political spy of General Bebzu's to watch the conduct of the Bolivian Emigrès, then resident in Salta, and I believe conspiring to overthrow his Government; it is needless to say how far rumor was from being correct, although not willing to be considered in such light, I took no trouble to prove anything to the contrary: it was sufficient for me then, to see, that my real object was as yet unknown, time would remove any momentary stigma that might attach to my name.

I now possessed, in different places, 42 mules and 6 horses and yet found them insufficient for my necessities, I could not stop in any place, the time sufficient for their getting into condition to stand another 2 months hard work and little *poor* feed, my presence was necessary near the

animals. I consequently bought 6 mules and 1 horse, travelling with mules, a horse with bell round its neck is an absolute necessity to keep them together, the horse is never used except in case of greatest emergency, during the night he is hobbled and the mules seldom or ever stray away from him. In passing from Molinos to where I then had the Alpacas, two small branch ranges of the Cordillera, or rather say, one range, in two places had to be passed, these at the time were completely covered with snow. On arriving at the first range on 14th August, of the three men that I had with me, two refused to continue on, and as argument was of no avail, I ordered them to unsaddle and leaving them at the foot of the range, proceeded on with Pablo; when in the middle of the ascent the road being slippery in the extreme, the mules hardly being able to obtain a footing on the frozen snow, I here ordered Pablo to await my return, and I went ahead to explore the pass above us—after toiling some two hours up the ascent, dragging my mule after me, I got to the top and commencing the descent on the other side suddenly lost footing, and fell, the sudden jerk made the mule also lose her footing, and away she went sliding down at a tremendous rate; I still holding on to the long "cabresto," or halter rope; we brought up without anything worse, than a few slight contusions, some 400 yards down; finding it impossible to regain the height, the road being one mass of ice, I slowly proceeded downwards—night coming on I had no resource but to look about for some sort of shelter if possible to be met with; not a rock could I find, and had to remain the whole night on the frozen snow with nothing but a poncho to keep off the cold. The next morning the mule was very stiff, and so was I, yet what could I do? to remain where we were was out of the question, to regain the heights quite an impossibility. I travelled all day on foot leading the mule after me and arrived at five in the afternoon to where the snow had nearly all melted away; here I fell in with pasture for the mule and a shelter for myself under some rocks. I soon unsaddled, hobbled, and well secured the mule—collected some "*Tola*" scrub and got a fine fire alight. No traveller in those parts ever thinks of undertaking a journey without taking everything with him, but *all* he generally carries in the baggage. I never travelled without a small iron pot in my saddle bags, invariably looked to the tinder box or "foguera", although I had nothing to *eat*, I regaled myself with mate or Paraguay tea.

The next morning, I again mounted the mule, and about 8 at night arrived at the hut of Bernardo Maurain, a very kind old Indian, owner of many sheep, who supplied all my wants. I remained here two days when Pablo joined me; it appears that he had waited where I left him until near midnight, had again descended to where we had slept the previous night, found the two men yet there, told them that I had passed and not returned and prevailed on one of them to proceed with him the next morning. On their passing the next day, this poor fellow, Alejo Coria, slid over the precipice on his mule and both were dashed to pieces down the abyss, one of my baggage mule was also killed in the slide down. Pablo and all the mules were slightly hurt—my escape was indeed wonderful, I attribute it to being on foot. We remained here another day mending our torn and broken packs, and then proceeded on our journey, rejoining the flock 10 days afterwards. Nothing particular had occurred during my absence, three only of the Alpacas had died.

Finding that the pasture round about was very scarce and that some months must pass before the fresh would spring up, I lost no time in proceeding to the nearest "vaelles" or valleys, where lucerne is grown, and securing a quantity against all contingencies. The distance I had to travel was 60 leagues or 180 miles. About a month afterwards I returned with 100 donkeys loaded with lucerne hay that stood me in, freight and every charge very near 14s. a cwt. This, however saved the flock for that season. The privations that the poor animals had undergone did not prevent my having by the 12th February, 1855, 113 lambs, the flock again presented a decent appearance. On 14th, Don Roman Cruz returned from his expedition without obtaining a single Alpaca, and assured me that it was impossible to obtain them, as the Indians refused to sell and were much alarmed. The journey of Don Roman was a useless expense to me of more than £200 or 1000 dollars, besides losing two of my best mules. I made up my mind to go myself into Bolivia, I had no passport, the country was in its semi-normal state of anarchy and confusion, but I could not remain inactive, besides, Don Roman told me that he had heard that a person answering Pedro's description had been taken, driving Alpacas, and was a prisoner in Oruro.

The next morning I was again on the road, and the following day were within the Bolivian Territory, that evening I arrived at the small town of "Esmoraca" and rode boldly up to the house of the Alcalde of the place. Shortly after arriving, my passport was asked for and where I intended going. I told him that being on the frontier and hearing that tallow was very scarce in the mining district of Carhuaicollo, I was proceeding to Sevaruyo to see my friend Don Avelino Aramayo, offering him a lot that I had for sale. He then shewed me the instructions he had from the Governor of the Province, ordering him to send to the Captain (Tupiza) all parties entering the Bolivian Territory without a passport, from the Bolivian Consul resident in Salta, attached to these orders was a list of suspicious persons whom they were particularly desirous to capture, and to my surprise I saw what was meant for my name "Sór Lecher" the second down as a suspicious political character. The surname is little used throughout the interior of South America, except when addressing a person by letter, (I have repeatedly received letters directed Sór Don Carlos el Inglés) and I cannot account for my name not being the Englishman mentioned otherwise than by oversight. However, as I had no passport, he told me that the morrow he should be compelled to send me to Tupiza in custody of eight Indians, in the meantime to make his house my own, &c., with all the politeness of the country. A little after I found out that his wife was very ill with an attack of "pleurisy" and as no medical man is ever to be met with in those out of the way places, and they suppose that foreigners must know every thing, he consulted me. I saw the poor woman, bled and blistered her, and by the morning she was very much relieved. Here a re-action took place in my favor also, the eight custodians were again sent to their homes, and I was allowed to proceed unmolested on my journey, with a passport duly signed and sealed by "Manuel Alarcon" the Corregidor of the "Muy ilustre villa de Esmoroja." My now amigo (friend) also supplied me with a guide, who turned out of the greatest use, and remained in my employ for nearly three years. Leaving the main road, that leads through many villages, our guide conducted us by a

totally uninhabited and trackless way to Sevaruyo, the large amalgamating establishment of Don Avelino Aramayo, a gentleman that I had had the pleasure to know for many years, and with whose mercantile house in Potosi, I formerly had business. The enterprise of this talented gentleman had raised in this desert waste an establishment without its equal in Bolivia. He employs there and in his mines at Carhuaicollo, distant seven leagues more than 1000 Indians; at Sevaruyo the ores are reduced by the system adopted at Friborg, and two German gentlemen conduct the amalgamation, all the vast plant and machinery has been brought from Europe and Valparaiso to the Port of Cobija, and from thence on the back of mules, a distance of 500 miles, to Sevaruyo. Just imagine the expense; some five English artizans were then in his employ, besides three Germans, and one North American. The annual produce of silver is calculated at 14,000 lbs. weight.*

I was greatly indebted to Mr. Aramayo during forty days, that on and off, I was a visitor at his hospitable house.

Resting three days, I went to Vilca Pujio and made a contract with the Correjidor there, to deliver me 200 Alpacas within 25 days, at the rate of 20 dollars each, I to receive them in Sevaruyo. Returning back to Mr. Aramayo's, I next day proceeded in search of Pedro; first, I went to Carangas, 55 leagues off and there obtaining no information, went on to Andamarca, 42 leagues, and so as to hide the object of my journey there, purchased 100 sestos of 22 lbs. weight each, of coca, on which I was aware I could gain in the Argentine Republic. Not being able to meet with an Indian ready, to immediately load on freight, his Llamas with the coca and chúno that I had bought, I accepted the offer of the "Justice of Peace" of Andamarca to sell me 100 tame carrier Llamas (wethers), that belong to the estate of an Indian some months deceased, under terms that they were in good condition, that he supplied me with four good men to attend them, and the sogas, &c. necessary for loading, at least 30. This was a great acquisition for us, each Llama carries almost as much as a donkey, and as they would travel at same pace as the Alpacas and never stray, we should save at least two men, much inconvenience, and have besides, the means of subsistance always with us during our journey; the meat being excellent. I embarked 4 that remained when we arrived at Caldera, 3 we eat during the passage, and the last one is at Liverpool. They cost 5 dollars each.

* No silver in bar or worked up is permitted to leave Bolivia, if discovered, it is confiscated, as also the mules carrying it; half of the proceeds goes to the party apprehending, and half to Government. Any silver met with out of main roads, although with a "pass" to Mint is liable to confiscation. All proceeds of mines to be sent to Mint in Potosi, where it is paid for 9 dollars per mk., or $\frac{1}{2}$ lb. weight of 8 ozs. Very often the conductors of bar silver have to wait several days, or until their own silver has been coined, and then only paid, this is a fact that Mr. Aramayo assured me of and as happening to him almost monthly. The Government or the Budget, gains annually by the coining of base silver $\frac{1}{4}$ dollar pieces, more than $1\frac{1}{2}$ millions of dollars. The loss to Peru since that money was forced into circulation there, passes 16,000,000 dollars, and the exchange of this base coin is most energetically claimed by Peru, and will without doubt be the cause of war between the two countries, if not so already. I mean to explain by this, that if any party takes to the bank 100 lbs. weight of silver, he ought to receive an equivalent value of 1800 dollars, he does receive the 1800 dollars curry of fictitious value, and 45 per cent. is copper, and 65 per cent. silver in the coinage of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ of the dollar.

Under pretext of looking up Llama carriers for conveying the coca, I went all over the province, the passport of my friend "Alarcon" doing me good service. I fell in with Pedro; 200 Alpacas he had succeeded in collecting. He had been a prisoner, but had managed to get away. Stopping with him two days, giving him the necessary instructions, and a detailed account of the road that I had come over, ordered him to make for the general "rendezvous" within the Argentine Province of Injuy.

On my return to Sevaruyo, Mr. Aramayo informed me that two days previous, an officer with ten men had arrived from Potasi, and searched his house, looking for me, stating that the orders from the President (Bebzu) himself were, for my capture and immediate remission to Chuquisaca, the capital of Bolivia. So as to prevent Mr. Aramayo from supposing that I was abusing his hospitality and that in reality I was mixed up in their detestable politics, I frankly told him my object. As the officer had returned to Potosi on not finding me, and supposing that I had returned to the Argentine territory, I saw no room for immediate alarm and determined on awaiting Obando's (the Corregidor for Vilca-Rujio) arriving with the 200 Alpacas that he had engaged to deliver. The twenty-five days had now expired, and started in search, and found him at Vilca-Pujio, doing all in his power to collect the animals; he had about 170 together, but the Indians refused to sell any more, and clamoured for the return of those already delivered, throwing the money at him that they had received—the number of women howling and screaming, the vociferations of the men, were indeed not to be laughed at, seeing that his authority would soon be entirely lost; I asked him to give me two of his soldiers, that with them and my three servants we would drive away without delay, those already collected. I immediately commenced driving the animals, and as they were fresh and in good condition they could travel exceedingly well; only a few Indians, it seems, understood what we were about, in fact, I firmly believe that the greater part imagined that I was interceding with the Correjidor for the return of the animals to them; on the animals leaving the yard, some fifteen or twenty men tried to oppose us; with two of my men and only using our thick thong reins we opened and drove them back on each side, seeing the opening, the Alpacas rushed through, not a minute elapsed ere stones from the slings of the Indians were flying about, in all directions, we all got our share, but none of us seriously hurt; for about two miles they followed us, then seeing that we were rapidly gaining on them, they desisted. The soldiers assuring me that I need entertain no alarm on Obaudo's account, I made up my mind to avail ourselves of the moonlight night and travel on without intermission. At 8 o'clock I sent back the soldiers, considering that we were able, four of us and well mounted, to keep the animals in the road—that afternoon and night we got over nearly 50 miles of ground. In three days more I arrived at Sevaruyo, and on counting the animals found that none were missing. So as not to lose time, I sent the animals on a head, ordering Soza, in charge of them, not to drive too quick, and not to wait anywhere for my joining him, but make the best of his way to the frontier, taking with him as guide the man that I had brought from Esmoraca. On 3rd April they started—6 men, 171 Alpacas, 8 donkeys loaded with provisions, and 3 mules. On the 6th Obaudo arrived at Sevaruyo, he had been a good deal knocked about by the Indians, one arm in a sling and his head bandaged up; he came accom-

panied with three old Indians, to whom he had promised to return the flock. As a matter of course, I would not admit any such idea, and at once paid the balance I was owing him. By what I could understand it appears that he, under authority of being Correjidor had taken the animals from the Indians, stating that the Government wanted them, paying for each 5 dollars or six dollars, so *he* made something out of the transaction, as I paid him at the rate of 20 dollars each. Somehow or the other he pacified the old "Tatas," as they all returned to their homes the next morning. I wished my kind friends Mr. and Mrs. Aramayo, and the several gentlemen in the establishment good-bye, four days afterwards I overtook the flock and found them gradually getting along, following behind them, there were some 35 to 40 old women that day and night kept up a continual howling, crying, and screaming, calling us all sorts of names, finding that they would not be pacified I paid no attention to them. The second morning after my arrival, they asked me for something to eat, I gave them provisions and coca, they then begged of me to be kind to the animals, stopped behind and we saw them no more; some of these poor creatures had actually travelled more than 300 miles from their homes, following the Alpacas that their husbands had sold to Obando. To avoid the small town of Tola-Pampa, I left the road we were then on, and the next day an officer and four soldiers overtook us; he asked me if I was Don Carlos, and on telling him that he was right in his conjecture, he pulled out an order for my arrest, signed by the Prefect of Potosi, expressing a hope that I would offer no resistance, but accompany him to Tola-Pampa. As nothing was said about the animals, and excepting the annoyance I attached no serious consequences to being made a prisoner. I ordered Pablo to get over the frontier as fast as possible, led him to believe that no harm would arise to myself, and finally assured him that if I did not overtake them, I should be over the frontier first. Selecting one of the best men as servant, and packing in the bed a few things, I told the officer that I was ready to accompany him. Now, it was anything but agreeable the idea of being taken to Potosi, and come what might I was determined not to go there for the present. I and the servant were very well mounted and the light load on the baggage mule would be no impediment to us, in the event of having to trust to our animals to escape. By all means, I had to gain time, the Alpacas had nearly 100 leagues yet to travel ere reaching a place of safety, and I could not calculate their doing that distance under twenty days at least. I was well aware that once in Potosi, expresses would be sent after the flock that I had left, and no doubt, the frontier being alarmed, Pedros also would be detained. By what I could fish out of the officer, who by the bye, being a lieutenant I always styled "mi Capitan" he looked upon me as a political prisoner of note and now and then deigned to lecture me on the folly of foreigners taking part in their domestic wars, on this point we heartily agreed, but I could not convince him that I knew, and cared nothing about the politics of his country.

Arriving at Tola-Pampa a guard was placed over me in the house of the Correjidor, yet every attention and consideration did I receive. During the night I made up my mind to be very ill; woke up the officer, who slept in the same room with me, and begged him to order some warm water as I felt very unwell: this was done, and the next morning being, if anything, worse, we could not move on that day; in this manner I managed to remain in bed five days, when he told me that I must go on my own mule or be carried in a litter; of course, I protested against such barbarous proceedings and prevailed on him to send to Potosi for orders; he accordingly sent off the Corporal, and as this would allow me eight days more, and suspecting that orders would come for my being carried, on the fourth day after the Corporal went off I began to get better, got up, and by the day the answer came, but by an Indian on foot, I was again *nearly* all night—as supposed, the orders were for carrying me by gradual stages to Potosi, but clearly expressing that no want of courtesy or civility must I be able to complain of. My animals had now fourteen days march ahead and I could easily stop, some four days longer ere carrying out the project I had formed for getting away. The next morning, he sent off two of the soldiers having had orders to that effect, and I now remained in charge of the officer and one soldier, and I certainly now was very certain that he should never take me to Potosi. During our stay in Tola-Pampa, every evening he used to take tea in my room, and with his tea, brandy that I supplied; this struck me as being a good chance for escape without violence. Having suffered a great deal from tooth ache, I always carried about with me morphine and laudanum. Well then, the third night after we left Tola-Pampa, I supplied him with a bottle of brandy well drugged with laudanum, not *too* much however, I took two cups, he took himself his usual quantity three, gave his soldier a stiff one too and turned in. The mules were all in the yard of the hut, so were the saddles. I got up softly and told Diono to saddle quietly and whistle softly when all were ready; soon after hearing the low whistle, I as quietly as possible took my saddle bags and all the blankets, leaving the mattrass, pillows, &c., took down the poles in front of the entrance and commenced driving out the animals. At this moment the old woman, mistress of the house cried out, and I heard her trying to rouse up the soldier. I had barely mounted myself, and was driving off the mules and horses ahead, for I brought away the two horses and two mules of theirs, when the soldier staggered out of the kitchen, fired his musket, and began singing out most lustily. It was too late for them to do anything, and I saw them no more. After riding about 2 leagues, we changed our saddles from our own mules to the horses of officer and soldier, the next day I got on the track of the Alpacas and followed it, and four days afterwards I got to where they were, having left on the road the two horses and two mules that did not belong to me, quite done up. We were now only some ten leagues distant from the frontier which we succeeded in passing without further trouble, two days afterwards. In another ten days I was enabled to join this flock, reduced to 169, to the others stationed in the "Abrade Quéta." None had died during my absence, 3 more lambs had been born. The whole of the time that I been travelling, having been off the main roads, I only once slept under a roof, every other night in the open air, and we were then in the middle of winter.

My funds being now exhausted, and having dependant on me in "Abrade Quéta" six shepherds, six travelling servants, one foreman, and in Pedro's flock—four shepherds, one guide, and one foreman—nineteen with their keep, entailing on me an expense of about £70 monthly. I determined on proceeding to Salta, distant 120

leagues, expecting to find there letters, with remittance from Messrs. Waddington, Templeman, and Co. I arrived at Salta in six days received letters, but *no* remittance. Mr. Waddington had returned from England, expressed great disappointment at my not being further advanced, and refusing further supplies until receiving more encouraging and positive news as to our where-abouts, and the hopes I entertained as to my being able to realize the undertaking. Writing and awaiting answer that I could only obtain in three months' time, would not help me out of my immediate difficulty. Meeting with an old friend, John Lord, Esq., a merchant, resident in Tarija, then in Salta, and just married there. I negotiated with him a draft on Tacna for 1000 dollars or £200; he moreover lent me 500 dollars or £100 to be returned out of first remittance from Valparaiso. This gentleman had been many years roaming about Bolivia and the Argentine Northern Provinces, collecting wools for account of Messrs. Joseph Hegan and Co., of Tacna. He naturally then, understood the difficulties of my position, and endeavoured to persuade me to throw up the project, as he was convinced that it was perfectly impracticable. With part of the money thus raised, I purchased seven fresh mules and proceeded to the Valles Calchaquies, forty leagues from Salta, with the object in view, of there leaving my exhausted animals, purchasing provisions (maiz, flour, rice, tobacco, &c., &c.,) and immediately passing by the Cordillera of "Acay" to rejoin the flocks.

On 10th July, arrived at "La Poma," I was assured by muleteers that had returned two days previous from Potosi, that the great quantity of snow that had fallen the last twelve days would have rendered the roads, particularly the pass of "Acay", altogether impassable, they had been severe losers, one out of 67 mules lost 49; another out of 53, lost 41; and the other out of 36, lost 29. They moreover assured me, that a force was to leave Potosi a day or so after they left, and that a report was current of their being sent to capture, or destroy the Alpacas, and re-take the Englishman (Inglés) who had escaped "by poisoning the officer and *soldiers* that were conducting him."

My principal flock being out of Bolivian territory, I considered safe, yet felt alarm for Pedro and his flock in the event of his not having succeeded in effecting a junction with the others.

Having obtained from my friend Don Pedro Corbalan the loan of two muskets, and a few packages of cartridges, I started off on the 12th (July) most anxious to arrive where the animals were, as the muleteers had also informed me that Pablo Zoba had received the intelligence, which they corroborated, of the force being sent to take or kill the Alpacas, and was moving with the flocks towards "San Antonio de los Cabres.

With very great difficulty, and the loss of one mule, we succeeded in passing "Acay" three days after leaving "La Poma," a distance of only twelve leagues—and in two days more, by going a head of the baggage mules I fell in with the flock at a place called "Taire," a large swamp of some three leagues in circumference; the Llamas that I had purchased in Audamarba (100) to serve as carriers, had arrived with the 100 sestos of coca and 9 cwt. of chuno, or frozen potatoes (much used in Bolivia for food.) I obtained no news of Pedro; the next morning my baggage mules joined us. Soza had very prudently moved on; he had received and opened a letter to me, per express, from a friend in Potosi (whose name I must not mention, as by doing so, I might even yet do an injury to), advising, that the Prefect had issued most stringent orders for the capture of the animals and myself, adjudicating the alpacas, mules, donkeys, and our baggage to the captors. A copy of this arbitrary note to all the Governors of provinces and Correjidores of villages on the frontier, is in my possession—this, with other notable ones, translated, will appear in the work I intend publishing.

I cannot here refrain from publicly stating that in noways have I infringed a single law of either Peru or Bolivia, that I have evaded the intention is one thing, to break or infringe a law or decree of Government is another. The decrees promulgated, state that it is illegal to drive Alpacas within a distance of 40 leagues of the sea-shore, and the penalty for so doing is stated to be the loss of the animals; and every person found with them and the owners, although not with them "de facto," are condemned to ten years work in chains, on the Chincha or Huano Islands. To smuggle animals out of Peru, IF successfully accomplished, could be done in twenty days. To avoid becoming amenable to such law, is why I took such a roundabout way, as getting the animals first into the Argentine Provinces, and then into Chile for embarkation, in both of which countries such restrictions do not exist. I am, however, very certain that had my intentions been known, effective means would have been taken to prevent my getting a single animal out of Bolivia, as after steps shew—the fact is, that I took them by surprise, and actually, in more places than one, obtained from minor authorities *passports* for myself and animals; had the Government merely had notified to the *Indians*, that the taking out of the country of Alpacas was prohibited, the real prohibition would have been more effective than the presence of 500 preventive officers all along the frontier—or any decrees of Congress.

With the four Indians that came with the carrier Llamas and another servant that I had brought from Salta, our whole force comprised twenty-three persons. We possessed one double, one single barrelled gun, one revolver, six shots, two muskets, and one carbine. My mind was made up, not to allow my property to be taken from me, without some resistance as a protest, before appealing for protection to the Government of Salta and the English Minister resident in the Paraná, and distant no less than 400 leagues, and the former 100 from where we were.

On the 19th, about 2 p.m., it commenced snowing very hard, in the evening, two men that had gone for fuel, just at the commencement, had not returned; we could not see two yards before us, the snow was falling so fast; all night long we fired at about every quarter of an hour a shot, so that the sound might direct the two missing Indians. The morning dawned and still snowing, some men went away a short distance to look after the lost, but as the snow was now deep they soon returned. All day we kept firing at intervals, and as the men did not appear, I ordered the discontinuance of the firing, as we had very little powder remaining. The snow lasted nine days and nights, now and then during that time it stopped for two hours, and then re-commenced. On the 10th morning, clearing away round about the animals we found dead, 89 Alpacas, 31 Llamas, 72 Alpaca lambs, 21 Donkeys, 3 Mules, and 1 Horse.

Three days after, our attention was drawn to several condors flying about a mountain on our left, and on sending to see what attracted them, my suspicions were too truly verefied, the man returned for assistance to bring into camp the

dead bodies of the two missing Indians; poor fellows, they were found with the bundles of wood tied on to their backs, and must have been frozen to death the first night. That afternoon we buried them and two more crosses on heaps of stones were added to the very many that are to be met with, along those inhospitable roads. I here *saw* for the first time, mules eating flesh, having had nothing to eat for ten days except snow, they greedily eat parts of the dead Alpacas. We also for the first time in nine days, got a fire alight, and you may easily imagine with what "gusto" we made disappear, pot after potful, a kind of "bargo" made of half-boiled Indian flour. On third day, the snow having partially melted and "tola" shrubs being visible, I determined on moving towards "San Antonio de Cobres," we could not remain at "Taire," the decomposition of animal matter emitted an effluvia that was unbearable. We arrived in front of the gully of "San Antonio de Cobres" on 1st August, and finding there a deserted hut with sheep pens around it, with plenty of pasture on the slopes of the high mountains to the west, on our right hand, and good pasturage on the plains to the east, I at once took possession; that night an Argentine Indian brought us the intelligence that soldiers had arrived at the village of the "Rosario" on the Bolivian Frontier, and distant some thirty leagues from us. I immediately wrote a note to Don Angel Cordova, Captain of the National Guard of San Antonio de Cobres, informing him of the occurrence and requesting his presence with all the force he could muster, as I was afraid they intended passing the frontier in our pursuit. I must here mention that we were now on the sheep run or estate of Don Manuel Anzoategin, father-in-law of my friend and countryman Mr. Lord, Don Angel Cordova was Mr. Anzoategin's overseer, and I had forwarded to the former some forty days before a letter from his master, ordering him to supply my wants and to do all in his power to befriend us. Remunerating the Indian, I sent him with the note for Cordova, who lived about eight leagues off. About 11 o'clock the next morning, two of my Indians, that I had posted on the top of the mountain on our right, and that overlooked every approach to us, came running into camp with the news that the soldiers were coming. I then told the men, that those who did not wish to help me to go up the hill and hide themselves among the rocks—not one went—they all said that they would do their best to prevent the animals being taken away, distributing the arms that only sufficed for five, as I kept the revolver at my waist for myself, remainder commenced gathering pebbles for their slings. About 1 o'clock the force came in sight, out of the gully, they no sooner saw us than they stopped, and formed in a most unmilitary manner, all being huddled together, there were six soldiers with lances, twelve Indians of the National Guard of "Rosario" and at their head Don Vicente Vasquez, Correjidor of Susques, another village under the order of the Correjidor of "Rosario," the latter came forward alone on his mule, and seeing this, I went to meet him on foot, leaving my mule behind. On meeting, he handed me his orders, and the circular from the Prefect of Potosi, after reading, I partially tore, and then put them in my pocket. He then asked if I was ready to accompany him, and if I would order *my* men to drive the flocks towards the direction from which he had come. He appeared quite amazed at my replying that I should do no such thing, that being out of Bolivian jurisdiction, I could only treat any attempt of his, to take my flocks away, as I would robbers, who, on a public road wished to despoil me of my lawful property. He then turned his mule and slowly rode off towards his men. I remained standing for a short time and then turned to walk back to the hut; he must have been *at least* eighty yards from me, when he turned his mule, and fired two pistol shots in my direction, certainly not *at me*, as they fell some thirty yards short.

The long and short of the affair is that my faithful fellows sent them about their business half an hour afterwards—our mutual losses and all details will appear in my intended work; indeed, I am afraid that I am trespassing too much on your patience, I will proceed if you desire it.

I now felt very uneasy about Pedro, as the whole frontier was alarmed and I had not been able to obtain any information respecting him.

The next morning Don Angel Cordova came to our encampment and it was with difficulty that I could make him believe what had taken place, the facts were however too evident, and as he was Judge of Peace of the district, I made him take our sworn declarations, and yet possess them with his signature attached. His official note to the Government of Salta, caused others to and from the Government of Bolivia, but as the latter country was embroiled in revolutions from that time up to when I left the Argentine Province in February of 1858, and as I did not make any claim myself, from fear that by doing so I might meet with detention and perhaps be the indirect cause of international quarrel, the affair has rested almost where it commenced.

On 9th, Pedro made his appearance with "Hario" only, his flock and the men with him had been detained at San Pablo, a village on the Bolivian side of the frontier; Hario is still with me, his father gave him to me some 6 years ago, he is now about fourteen years of age.

The Correjidor of "San Pablo" with a lot of Indians took away Pedro's flock, he had heard that soldiers had passed on to Rosario in search of us and hurried on by another road *via* Santa Catalina, thinking he might be in time to put us on our guard, and be of some help to preserve the other flocks, when his as we all supposed, was irretrievably lost. His surprise was great when he found, that the attempt had been frustrated, of our loss by snow storm he had heard. It was now necessary to commence taking measures for wintering, lay in a supply of lucerne hay for the animals, and provisions for ourselves. I consequently (14th August) sent Pedro to the "Valles Calchaquies" distant forty leagues with the coca, keeping only a small quantity for my own Indians, ordering him to sell it to best advantage and with the money purchase 30 or 40 tons lucerne hay; a few days after I sent in charge of Pablo Soza all the llamas, donkeys, and mules that I could muster and spare to bring up the hay, and also ordering him in combination with Pedro, to freight as many more mules or donkeys as might be required to convey to San Antonio, the hay they might be able to obtain.

I remained with the animals, having with me the six men that I had engaged in Andamarca and Sevaruyo, Hario and Clement, two lads, the former about 10 and the latter 8 years of age. I did not fear any further attack from the Correjidor of Susques, at any rate for the present, we had heard of the return to Potosi of the soldiers, and I knew how difficult it would be for the Correjidor to collect together again, even a dozen Indian without his having half a dozen soldiers as a "nucleus" of power, and even then, the reception we had given them before, had been rather too

severe for poor unpaid, forced, half clad wretches, to be eager in again provoking. I several times had seen one or two strange Indians talking with my men, and on asking who they were, said they were men enquiring if they had seen some donkeys that had strayed, as this in reality had repeatedly happened before, and I myself had been asked the same, I thought no more about it.

(To be Continued.)

SOME REMARKS ON THE SANDAL WOOD OF THE SOUTH SEA ISLANDS.

By John MacGillivray.

(Read before the Horticultural Improvement Society of New South Wales.)

The valuable article of commerce forming the subject of this short paper, is well known as one of our principal imports from the South Sea Islands, and as employing in trading for it several vessels belonging to this port. But, as none of the sandal wood so acquired remains long in the colony, comparatively few persons have ever had an opportunity of seeing a sample of what everyone has heard of. I have, therefore, strung together a few notes upon the subject of sandal wood, which I proceed to lay before the Society.

The wood under consideration is the product of various trees, belonging to the genus *Santalum* of botanists, and that species called *Santalum album* for a long time furnished the principal supply. Being a hard, close-grained, and ornamental wood, it is used for some descriptions of cabinet work, and various carved, ornamental, and useful articles—as writing desks, work-boxes, card-cases, &c., are made of it. But its chief characteristic consists in the remarkable smell of the wood which it owes to the presence of a peculiar volatile oil, extensively used by the natives of India as a perfume, and also on account of certain reputed medicinal properties. This also has acquired for it its principal use as that of being burned as incense in the temples of China. In course of time sandal wood was discovered to be abundant in some of the South Sea Islands, where it is the product of various kinds of *santalum*, all of which are different from the long known Indian one. Thus two kinds have been described as inhabiting the Sandwich Islands *(S. Tracinetiatum* and *S. Parientatum)*, and are not met with elsewhere; and, to my own certain knowledge, the sandal wood trees of Feejee, Aneiteum, and the Isle of Pines, constitute three distinct species, which I believe are yet undescribed, rendering it probable that there are several other kinds in the South Sea Islands quite as distinct, but yet to be botanically described. It must be borne in mind that samples of the wood alone are not sufficient to enable one to decide specific differences: examination of the leaves, flowers, and fruit would be necessary for these purposes. The sandal wood tree is not found on all the islands of the Pacific: its head quarters would appear to be among those of the south-western portion, including New Caledonia, the Loyalty Islands, New Hebrides, Espirito Santo, and some others. In the Feejee Islands, which have produced several thousand tons within the last thirty years, the tree has become very scarce. For instance, at Ovaiau, all the natives and white residents whom I spoke to on this subject agreed that it was no longer to be found there, so that I considered myself fortunate in one day stumbling upon a small sandal wood sapling, growing in the interior of that island, which still more fortunately was in a condition to furnish flowering specimens for my collection. Precisely the same thing happened at Aneiteum, when the only growing sandal wood I ever say during numerous excursions was one so small as not to have been deemed worth cutting down. And at the Isle of Pines so exhausted has the supply of sandal wood become that the natives had actually taken to grubbing up the roots of trees cut down in the earlier days of the trade, and all my efforts to obtain a section of the wood might have been ineffectual had not accident led me to the tree which furnished the specimen on the table. Even then, owing to its increased value, I had difficulty in obtaining permission to cut it down, owing to the absence of the chief, to whom it was requisite to make suitable compensation.

It is only the central portion of the tree which produces the scented yellow wood, constituting the sandal wood of commerce. The trunk and larger branches are cut into lengths of from three to six feet, and the whole of the bark and outer white wood is removed with the axe, an operation technically called *cleaning*. Thus a log a foot in diameter is reduced to a billet only from four to six inches thick. The quality of the wood depends on the quantity of oil contained in it, as indicated by the smell when freshly cut or burned. The old trees produce the best, and in them that part of the wood near the root is the most prized.

From want of data, I have no means of estimating the amount of capital sunk in the sandal wood trade; the profits however, I have reason to believe, are sometimes enormous. But while this trade is a lucrative one, the risks are very great, both to lives and property embarked in it. Probably about twenty-five small vessels connected with Sydney, are engaged in the sandal wood trade, with which is combined the collection of tortoise-shell, cocoa-nut oil, bêche de mer, yams, pigs, &c. It is also the means of introducing among the islands large quantities of what is technically called *trade*, consisting of iron instruments, arms and ammunition, calico, &c. Formerly the sandal wood trade was carried on under much greater difficulties than now, on account of the fierce and treacherous disposition of the islanders, who have repeatedly attacked, sometimes successfully, the vessels employed in it, and more frequently boats' crew and shore parties were cut off. That many of these attacks were provoked by the white traders is a matter of notoriety, but in most cases the reverse is attempted to be made out, and many murders and other atrocities committed by the sandal wood traders have been carefully concealed by those who, it may be inferred, could not justify them. On the other hand it is positively certain that in several instances the natives have been the unprovoked aggressors. The sandal wood is either brought off by the natives to vessels or boats about the coast, or is collected and stored up at various stations left in charge of a white man or two, when such can be done with safety. Some of these stations are of considerable importance, as those at Tana and the Isle of Pines belonging to Mr. Paddon, where there are extensive stores containing articles suitable for conducting the sandal wood trade, and supplying and refitting the small vessels which rendezvous there from time to time.

The sandal wood collected in the South Sea Islands is intended to reach its ultimate destination in China, where I believe the quantity now stored up is very great, the unsettled state of that country at present having greatly affected the trade and rendered it prudent for the owners to hold on until the market takes a favourable turn.

In China, sandal wood is usually worth from £20 to £30 a ton.

In such of the South Sea Islands as produce it the sandal wood is often employed to scent, the lower nut oil used to anoint the body and smear the hair. For this purpose the wood is rasped down with a piece of sharks or leather jackets' skin, and introduced into the oil which in course of time becomes strongly scented. As a perfume, however, it does not seem to suit the taste of Europeans. A handful of the shavings of the wood will prevent moths from attacking clothes of any description, and I have successfully used the same means to keep away insects from preserved specimen of Natural History.

Sandal wood is also an Australian product. Some few years ago a considerable quantity was collected in Western Australia and sent to China, but, on account of its very inferior quality it did little more than pay expenses, and the speculation was abandoned as being an unprofitable one. About 6 years ago, a small vessel (the Will o' the Wisp) was despatched from Sydney to procure sandal wood on the northeast coast of this colony, but various disastrous occurrences caused the early abandonment of the voyage. A little of the supposed sandal wood procured on this occasion, and which I saw, was commercially valueless, being the product, not of a *santalum* (of which genus there are several Australian species) but of *exocarpus latifolia* a tree belonging to a different natural order of plants.

Lastly, when it is considered that the supply of South Sea Island sandal wood is annually decreasing, and will in all probability cease altogether at no far distant period, it becomes an interesting matter of representation to ascertain whether it could not profitably be grown in this colony. Perhaps, when the experimental garden of the Society shall have been established, this point will be one of those deemed worthy of further notice.

JERUSALEM ARTICHOKE.

Artichoke, Jerusalem, *Atelanthus tuberosus* of botanists, a perennial tuberous esculent rooted herbaceous plant, of the sunflower family.

It is called artichoke from a resemblance in the flavour of its tubers to that of the heads of the true artichoke, and it bears the absurd title "Jesusalem," from an ignorant corruption of its Italian name "Girasole."

It is a native of Brazil, and was introduced to Great Britain in 1617. The plant has the habit of a common sunflower, but grows much taller, often rising ten or twelve feet high, having three nerved, scatrous leaves, and produces a yellow flower.

Though the native of a warm country, it has proved to be one of the hardiest of cultivated plants in Britain, and has the advantage of being easily propagated, very productive, and grows on the poorest soils.

It was highly esteemed by our ancestors for its tubers, and though inferior in flavour and other qualities to the potato, yet it scarcely deserves the disrepute into which that more favoured esculent root has thrown it, but merits considerable attention and would well repay somewhat extensive cultivation.

It grows under shade, can be cultivated in woods and half waste ground with certain success, and might also be raised with advantage on barren or exhausted soils, proving of the greatest value to the farmer or grazier as a store against the dry seasons which sometimes visit the Australian colonies.

The tubers are more watery than potatoes, and frequently have the effect of producing flatulence, yet they are eagerly eaten by most gramivorous animals, and constitute decidedly good food for farm stock. It is also particularly useful for the feeding of swine and is uncommonly productive.

"In England, one spirited cultivator found its produce to be about 480 Winchester bushels per acre without manure.

"Another has stated that he obtained between seventy and eighty tons from one acre; and he is of opinion that seven acres will produce 396 tons, which will keep 100 swine for six months, allowing each head 56 lbs. per day."

Having stated the almost incredible produce of an acre in England, what might be expected in this highly favoured land, where both soil and climate must be conducive in improving the nutritious qualities of this esculent root, as well as heighten its productiveness. As this plant thrives in almost any soil, and its culture is by no means difficult, being nearly the same with that of potatoes.

I am of opinion that the Jerusalem Artichoke might be very profitably raised on the many barren and unoccupied sand hills around Sydney and the adjacent country. Besides assisting in reclaiming the soil and stopping the march of sand it may also by a little attention to its cultivation upon the arid ridges soon lose the wateryness so much complained of, and become a favourite vegetable.

The following are the conclusions arrived at by M. Bousingault:—A tuber which was analyzed, weighed when fresh from the ground, 1 oz. and 15·6 dwts., and after being dried in the stove 0·7 dwts. One part or integer of this tuber was reduced, after absolute desiccation to 0·208 one parts of the dried tuber was reduced, by burning to 0·594—and its constitutional element were ascertained to be 43·2 per cwt. of carbon, 5·91 of hydrogen, 43·56 of oxygen, 1·57 of azote, and 5·94 of ashes or earthy and saline ingredients.

The tuber of the Jerusalem Artichoke is not very much more watery than the potato, and is exceedingly less so than the turnip.

"The proportion of dry matter in the Jerusalem artichoke tuber is ·208, in the potato ·241, and in the turnip ·75. And in the proportion of water in the Jerusalem artichoke tuber is ·792, in the potato, ·759, and in the turnip ·925."

As this shews the richness of the artichoke to that of the turnip, and the almost equal proportion of nutritious matter in the potato.

Having now pointed out a few of the many valuable qualities which belong to this root, I will now leave this subject in the hands of those who might be more able to describe and prove the true merits of this esculent vegetable.

JOSEPH GRAHAM.

Darling Nursery, Feb. 5, 1856.

HORTICULTURAL IMPROVEMENT SOCIETY OF NEW SOUTH WALES.

Floriculture for Ladies.

The following interesting paper, on "Ladies' Miniature Flower Gardens," was read by Mr. Lindsay C. Shepherd.

In addressing these few remarks to the ladies, I do not desire it to be thought that I wish to impose too heavy a task, by asking them to accustom themselves to the use of gardening implements which, they may contend, belong alone to men. I do, however, desire, most sincerely, that they would bear with me a little while; and I do hope to be fortunate and happy enough to induce them to agree with me, that

one and all can engage in the delightful, humanising, and refining pursuit of gardening without abusing, in the smallest degree, (but adding to) the most delicate and refined feelings which the sex so generally possess. Many of Britain's noblest daughters (and who can say, their's is not an example worthy of being followed by the fairest of Australia's daughters) take a very warm interest in the pursuit of gardening, and spend many a happy and instructive hour in bringing to mature perfection, their lovely and innocent little garden favourites, which, under their tender and solicitous care, may successfully compete with specimens grown by the most experienced and efficient gardener. If, then, in a climate like that of Britain where so much care is required, the fair hand of woman can bring flowers to such perfection; what could not be accomplished by the same careful hand in a climate so congenial to the growth of plants as ours? I would say to one and all, *Try!* I do not wish them to undertake the arduous duties attendant upon the preliminary arrangements of forming a garden, but will suppose that, in the absence of a duly qualified gardener, a kind brother or friend will volunteer to dig, add to, or take from the ground marked out as a site for a garden, in fact do all the coarse work, preparatory to the planting. A set of gardening implements will then be required, (these are now to be otained, manufactured expressly for the use of ladies,) and should comprise, spade, hoe, rake, garden-trowel and line, knife, watering pot, and syringe. I will leave the arrangement of the plants to the fair planter, not presuming to advise in matters of taste. The plants which I would confide to their care, would comprise such as roses, daphnes, heliotropes, fuchsias, wallflowers, carnations, pinks, musks, stocks, lavender, salvias, snapdragons, cupheas, violets, mignonette, primroses, daisies, lilies, sweet alysum, candytufts, verbenas, phloxes, hyacinths, ranuculuses, anemonies, tulips, cyclamens, &c. And, if the garden be of sufficient size, I would add a few larger growing, but very beautiful plants, such as camellias, bignonias, magnolias, azaleas, heaths, &c. The above list is of so varied a character, that the plants comprised in it would, if cultivated, keep up a succession of bloom throughout the year, and their cultivation would afford at least an hour's healthful recreation (I will not say work) every morning during the year. The garden should be in readiness for planting by the end of May, and the only rule to be observed in carrying out this work, is, always plunge the plant about an inch deeper in the earth than it had been formerly, then press the earth gently, but firmly all round the stem, and if the ground be dry, a little water should be used. Bulbs should be planted in small figures, or clumps, near the edge of the border, and should not have more than from one to two inches of soil over them, according to the strength of the bulb. The plants already mentioned, with perhaps one or two exceptions, are, quite hardy in this climate, and will only require, very little attention after have been well established. All weeds should be destroyed, while young, and the borders kept quite clean, and this, together with the destruction of insects, and the removal of all withered leaves and flowers, will form the greater portion of the task I would wish undertaken; and what will be the reward for the small modicum of time thus spent? Many of natures choicest gifts in the family of Flora, will respond much more gratefully to care bestowed by woman's tender and delicate hand, than they will to the coarser and less gentle hand of the other sex. The lily and the rose will flourish, and vie with each other, in offering their charms, as if in grateful acknowledgment for the care bestowed upon them. They are designated "Queens of flowers" in the following beautiful limes by Cowper :—

> Within the garden's peaceful scene
> Appear'd two lovely foes
> Aspiring to the rank of Queen,
> The lily and the rose.

The perfume of the violet, wallflower, daphne, and mignonette, and the bright and beautiful flowers of the carnation, ranunculus, anemone, and tulip, will welcome you in the morning, and with their united fragrance and beauty win your love, and bind still closer to them the affectionate hand which has so carefully tended to their wants, and guided them to maturity, thereby enabling you more cheerfully to fulfil the duties of the day. The foregoing portion of my paper treats only of out-door gardens, there are, however, other kinds, which those less favoured, and by far the larger number, can avail themselves of, I mean pots, boxes, vases, cases, and tubs—suitable for windows, balconies, verandahs, or small back yards. In pots and boxes may be grown, with success, many tender, beautiful, and delicate plants (which will add much to their value) in the centre of the most dusty and disagreeable town. In this kind of culture, drainage should be particularly attended to, boxes should have holes one inch in diameter, and four inches apart, bored in the bottom, which should then be filled to the depth of two inches with broken pieces of flower-pots or bricks, this work, as well as furnishing some good rich mixed soil, should be performed in the same manner as the rough work of the garden. It will then remain to choose the little collection destined to become the occupants of the pots or boxes, which should be planted in the same way as before recommended, and as plants cultivated in this way are more confined, and require more nourishment than those grown in the open border, guano should be applied in the following manner, but only during the growing season, that is when plants are making young shoots; dissolve one ounce of guano in one gallon of water, and supply each plant with one pint of the liquid (more or less) per week according to size, varying a little as experience will point out.

The Wardian case (under various modifications) is now much used in England, particularly in large towns, for growing certain descriptions of plants. The particulars of its invention may not be uninteresting to many of you, who are probably unaware of the manner in which the invention of this valuable, portable plant-house was consummated. Mr. Ward was an amateur who took great delight in the cultivation of plants, so far as his limited extent of garden would admit of, and of all little family the *Fern* tribe claimed precedence, and he experienced much difficulty in even keeping them alive, in consequence of the injurious effects of the smoke, dust, and impure atmosphere which is always found in large and densely peopled towns, he had therefore, almost despaired of ever being able to grow them, until, in going through his back yard one day, he, by chance overturned a broken bottle which had been lying inverted and undisturbed for a length of time, when, to his great delight and astonishment, he discovered a rare and valued fern growing in all its native luxuriance, and one which he had frequently, but in vain, fostered and cared for. This discovery, simple as it may appear, opened up a new field for the amateur, who employed glass in

his further experiments, and at length, by perseverance and attention, invented glass cases, and was thus enabled to grow his little favorites in the full vigour of health and beauty. These cases are now employed in sending plants to the remotest corners of the habitable world, and have been the means of transporting many valuable trees and plants from one country to another, which otherwise could not have been done. In these cases may be grown many very beautiful and highly interesting little plants, such as orchids, pitcher plants, ferns, lycopods, and mosses. For this purpose the case should be filled to the depth of about twelve inches, with a mixture composed of decayed bark, leaf-mould, sand, broken crocks and stones; the plants should then be planted, some attached to pieces of wood or bark, others to stones, and the remainder in the earth. Epiphites may be tied to pieces of wood or bark, and suspended by wire from the top, or fixed to the sides of the case, which should then be closed and shaded, and only opened once each day for the purpose of watering, which should be done by means of a syringe. The water should always be exposed to the air for at least twelve hours previous to being used. During the growing season, the temperature, should be kept as equal as possible. With a humid atmosphere, when the plants have made their growth, and require rest, the supply of water should be very considerably lessened, but by degrees. The supply should again be gradually increased, as the growing season approaches. If the case be well drained and attended to, the plants will continue to thrive for years, without any change, further than removing any decayed leaves, or flowers, which, if allowed to remain, might cause the decay of the plant to which such leaf or flower belonged.

There are many interesting little aquatics which may be grown freely, either in ornamental vases, or in small tubs; these should be about half filled with mud procured from the bottom of a fresh water pond, then filled to within one or two inches of the top with pure water. Place the plant in the vessel so prepared, and keep the water always at the same level, by a frequent supply, which should be exposed previous to use, in order to obtain equal temperature with that in which the plants are growing. The application of water of a colder temperature would check their growth, and have an injurious effect. All decayed and decaying substances should be moved at once. Bell and hand glasses would be of great assistance in protecting and establishing young and tender plants, and would be found useful in any of the foregoing modes of culture.

The love of novelty in plants is productive of much good. It induces many to cultivate plants who might otherwise never be so employed, and the introduction of a new plant tends to lower the price of the old one; thus the poorer classes are enabled (if inclined to do so) to procure plants, which a year earlier were beyond their reach. Any occupation which tends to interest the people in the love and study of innocent beauty, is highly valuable, both in a moral and social point of view; and therefore, there is perhaps no surer evidence of the progressive improvement of a country, both in morals and in wealth, than the devotedness of its people to the love and culture of flowers. It is also worthy of remark, that in the catalogue of those who are guilty of crimes, there are, perhaps, fewer gardeners than there are of any other operatives in proportion to their numbers; and probably the remark might be extended further than to operatives merely.

Flower fanciers frequently give almost fabulous prices for new or rare varieties of flowers. "During the tulip *mania*, in Holland (says an English writer), there was a favourite variety, *Semper Augustus*, of which a single root sold for four thousand six hundred florins, together with a new carriage, horses, and harness complete. The money portion of the price is easily counted, being four hundred and two pounds ten shillings; but the value of the carriage, horses, and harness is not so easily estimated, though it has been supposed that the total price of the tulip could not have been less than six hundred pounds! and though Holland was a very wealthy country in those days, yet the price, rated at the present value of money, must have considerably exceeded a thousand pounds. No such sum is of course now (1837) given for a single tulip; but still a tulip bed, of the very first class, cannot now be furnished for less than five hundred or six hundred pounds." In this country we have not yet, however, arrived at any such extravagant ideas of the value of plants. At the present time, even with the reputed high rate of wages, an acre of ground (if not very unfavourably situated) can be enclosed, properly laid out, and planted with the very best description of flowering and ornamental shrubs and trees for a sum not exceeding the cost of a first class tulip bed in England. Here, then! is an inducement which should not be lost sight of by those who have any desire to promote horticultural and arboricultural science in this colony. I have only to add that, in a paper of this nature, it is not possible to enter minutely into the various modes of culture, and treatment, required by the many families of plants mentioned; but if the rules I have laid down be adhered to, experience will soon suggest the various smaller yet not less important details in a much clearer way, and be much more practically useful than any written treatise could possibly be; and I have no doubt but that success will crown the efforts of the fair artist, who will not only gain by possessing a garden of her own, from which to cull the small bouquet, but she will find that an hour spent every day in the culture of flowers will conduce more to her health and strength than any other recreation or employment. And should I be so fortunate as to induce any of you to turn your attention to this chaste and pleasing study, I am quite prepared to submit myself to the torture of your displeasure—a torture than which (to me) none can be greater—if you are not abundantly satisfied, and more than remunerated, by your unfailing attainment of health, strength, and happiness.

TASMANIAN WATERS.

At the monthly meeting of the Royal Society of Tasmania, held on the 15th February, the following contribution on the composition of certain waters in Tasmania, from Professor SMITH, University of Sydney, was read by the Secretary:—

The following six specimens of water were supplied to me by John Walker, Esquire, Hobart Town. They were not in sufficient quantity for full analysis, but such leading points were made out as would determine their fitness for domestic use.

No. 1. Water from the Derwent, collected at Clarendon, about 12 miles above the influence of the tide. Specimen clear and bright, of a pleasant taste, and without smell. It had deposited a slight sediment.

No. 2. From the Lachlan at New Norfolk, a tributary of the Derwent. The water was clear, but not quite colourless, and had a faint smell and taste of sulphuretted hydrogen. A moderate sediment of grey flocculent matter had collected in the bottle.

No. 3. From the springs on Mount Wellington, that supply Hobart Town with water. They are about five miles from town, and about 2500 feet above the level of the sea. Water clear and nearly colourless, taste good, faint smell probably derived from the cork, this and all the samples having remained six months corked down before being examined. A trifling sediment was found in the bottle.

No. 4. From the head dam of the Launceston Water Works, on St. Patrick's River, 1160 feet above high water mark, and about thirteen miles from Launceston. Clear, and nearly colourless; taste good. Moderate sediment of grey flocculent matter.

No. 5. From the head pipe dam of the Launceston Water Works, on Distillery Creek, four miles from Launceston, and about 320 feet above high water mark. This specimen was collected in September 1857, before the water of St. Patrick's River was turned into Distillery Creek. The water had deposited a moderate sediment of grey flocculent matter; it was clear and almost colourless, but had a slight taste of organic matter.

No. 6. From the Cataract Shutes on the South Esk, from which Launceston was formerly supplied with water. Specimen clear and bright, moderate sediment of grey particles.

The following table exhibits the solid matter dissolved in each water expressed in grains per gallon, distinguishing between matter of mineral origin and matter of vegetable or animal origin (organic matter): the figures in the column of organic matter represent the loss that the total solid matter sustains when heated to low redness, and although this loss is usually put down as organic matter, it must generally be somewhat in excess of the true organic matter in amount. The table shews also the hardness of each specimen in degrees. *Hardness* in water is caused usually by compounds of lime and magnesia, and it is estimated by finding how much soap a given bulk of any water will destroy. By a *degree of hardness* is meant that amount of hardness that would be communicated to water by dissolving in it one grain of chalk to the gallon.

River.	Mineral Matter.	Organic Matter.	Total Solid Matter	Hardness.
1. Derwent	1·76	1·44	3·20	1°
2. Lachlan	4·32	1·44	5·76	
3. Mount Wellington	3·20	0·96	4·16	1°·6
4. St. Patrick's River	2·72	0·96	3·68	0°·5
5. Distillery Creek ...	4 8	3· 2	8· 0	0°·9
6. South Esk	3·36	1·12	4·48	1°·4

The mineral matter was of much the same quality in all the specimens. It consisted chiefly of carbonate and sulphate of lime, sulphate of magnesia and common salt, with minute quantities of silicia and iron. In no case did the mineral matter amount to so much as to be of any consequence. All the specimens (with the exception of that from Distillery Creek, which contained too much organic matter) must be reckoned pure, and well adapted for domestic use.

Being in Launceston lately I took the opportunity of testing some specimens of the town water that had passed through some considerably length of lead pipe, one pipe was said to be about 200 feet long. In this case I found a small proportion of lead in the water, probably not more than one-tenth of a grain per gallon. In the other cases I found no lead. It thus appears that the Launceston water may be conveyed through moderate lengths of lead piping without receiving any dangerous contamination.

ON THE CULTURE AND PREPARATION OF COTTON IN THE UNITED STATES OF AMERICA.

By Leonard Wray, Esq.

(Extracted from the Journal of the Society of Arts, December 24, 1858.)

The subject of Cotton growing in Australia has so frequently been brought before the public that we are convinced the following paper which contains the most recent and authentic details on the mode of cultivation adopted in America, will be read with great interest by all those who feel the importance of adding to the staple productions of this colony.—[Ed. *S. M. S. A.*]

Statistics inform us that the annual consumption of cotton in Great Britain amounts to about 2,300,000 bales, weighing in all 920,000,000 lbs.

This vast quantity of the raw material keeps our numerous cotton manufactories in the proud and enviable position which they occupy, giving employment to so large a proportion of our population, furnishing cargoes to the merchant shipping of the world, and rendering almost every country on earth tributary to the industry, skill, and enterprise of our British "cotton lords" and their admirable artizans.

A great national industry, such as this, creates not unnaturally, unbounded jealousy in rival nations towards our country; whilst amongst ourselves, there is undoubtedly an increasing anxiety lest from any cause an adequate supply of this important staple product should not be obtainable. The bare possibility of this supply being suddenly cut off, and our cotton manufactories being thereby stopped, is indeed sufficient to create the most anxious alarm in every thinking man's mind in the United Kingdom.

Our cotton reports show that our own territories furnish us with only about one-eighth of the quantity employed by our manufacturers, whilst seven-eighths are supplied by the United States of America. Could we feel certain that no circumstances can ever arise to interrupt this vast supply from America, this country might, to a certain extent, be excused for viewing the subject with indifference, but common sense, and the experience of all time, unhappily forbid our entertaining a confidence for which we have so slight a warrant.

The say the least of it, even the bare probability of such an event constitutes a perpetual menace to this country, and imperatively demands a remedy and a safeguard. Fortunately, men of the right stamp are daily becoming more and more alive to the vital importance of this subject, and are bestirring themselves to render the supply of cotton to our factories more dependent upon our own exertions, and less upon the necessities

or goodwill of our friends and cousins in the New World.

The course which is the most obvious, and which is indeed the only one we can reasonably pursue, is that now entered upon by these Manchester gentlemen, viz., the encouragement of cotton culture in the numerous colonial possessions of Britain—in the negro territories on the west coast of Africa—and in other suitable localities.

The production of cotton in the British possessions has been confined almost wholly to India; and that it admits of enormous extension in that noble country, every one acquainted with the subject must be fully aware; but attention has also been forcibly attracted to the peculiar capabilities of our Australian, African, and other colonies, for the production of the same article; and every exertion will no doubt be made to obtain a certain supply from these sources.

The cultivation of cotton, however, is something quite new to the British colonist, and, indeed, I may say to the British nation altogether, inasmuch as the English have never yet seriously engaged in this important culture.

Hence we find in this country the greatest possible ignorance existing respecting the different kinds of cotton, the modes of cultivation, and its preparation for market. If we go outside the circle of cotton brokers, and make an inquiry on any of these points, we are told that absolutely nothing practical on the subject is generally known, but that we are sure to find something about it in some of the large encyclopædias.

Now, to any man who may meditate entering on this culture, or to any body of men who may desire to induce others to attempt this enterprise, such want of really practical information is a very great and serious obstacle, one which effectually frightens both the capitalist and the colonial planter. In the commencement of last year, I paid a visit to the United States, and became the guest of one of the great cotton planters in South Carolina, where I had the opportunity of seeing the methods pursued, both in that State and in Georgia, from the sowing of the seed to the pressing of the bales by steam power, prior to their shipment for New York, and for England.

I had seen cotton cultivated in India, and an attempt at cultivation in the colony of Natal; but here I was in the very heart of the cotton region of America, and I resolved to become master of the whole subject, in order that I might, at some future time, make my observations useful to the interest of my own country.

As an agriculturist myself, I was well aware, that to understand the subject thoroughly in all its bearings, it was necessary to study closely the whole question of labour; *id est*—slave labour as compared with the free labour, such as England commands in her various colonies. A fair comparison of these opposing conditions affords us a clearer conception of the chances which each system will have in the great struggle about to take place between them. Quite apart from the questions of climate, soil, and seasons, is that of labour; and it is one deserving the most attentive consideration, for on it mainly depends the pecuniary success of any attempt to grow cotton for the markets of the world.

My observations on all these points I will now endeavour to lay before the Society, hoping that they may prove interesting and useful to the country at large.

When we speak of the culture of cotton, it is necessary to understand most clearly, first of all, the great difference which exists between the long staple, or Sea Island cotton, and that known as short staple, or Up-Land Georgia; the former ranging in price from 10d. up to 5s. per lb., whilst the latter commands only from 3d. to 10d. per lb., (these being the extreme ranges of price in the two descriptions of cotton): and secondly, the important fact that the cotton plant yields, besides its lint, other valuable products; viz., a pure, bland oil, equal to that of the olive; an oil-cake most excellent for feeding stock, and a fibre from the bark of the plants, which may probably become of great importance.

As it is very desirable that these auxiliary products should be borne in mind, I have mentioned them thus early, for in all calculations of produce from a cotton plantation they seem to have been almost entirely ignored hitherto, although I am not satisfied that, in many cases, they may not yield as large a money return to the planters as that from the cotton itself.

Even in the United States, which produces annually some 3,000,000 bales of cotton, it is very recently that the valuable character of the seeds has been partially turned to profitable account; hence we find that very very few planters have yet availed themselves of the pecuniary advantages derivable from this source.

It is generally calculated that short staple, or up-land cotton, yields from two to three pounds of seed to each pound of ginned cotton, or lint, whereas, long staple cotton gives a much greater proportion of seed. In the rich lands of Alabama, Mississippi, Louisiana, &c., the short staple seldom gives, on an average, less than three pounds to the pound of lint.

I ask particular attention to the following account, published in New Orleans last year, by Dr. Jenner Coxe, shewing that an increased value of more than £7,600,000 sterling might be given to the cotton crop of the United States by utilizing the cotton seed, which is now almost wholly wasted.

The statement is by Mr. Woodall, confirmed by Mr. W. P. Converse and by Dr. Coxe himself.

"Average cotton crop of the United States three million bales, at 400lbs. per bale, will be of ginned cotton 1,200,000,000lbs. To each lb. of cotton there are 3lbs. of seed,—3,600,000,000lbs.; retained for re-sowing, including waste, &c., 1,800,000,000lbs.; leaving, for making oil, oil-cake, and soap, 1,800,000,000lbs.. 100lbs. of cotton seed will yield two gallons of oil, equal to that of Italy termed "Salad oil;" and it sells in New Orleans at 4s. per gallon, whilst in New York it fetches 6s. per gallon; 48 lbs. of oil-cake, (equal or superior to linseed cake,) and 6½ lbs. of soap stock, which, with ingredients of small value, will make 20 lbs. of soap equal to the best European kinds."

The following, then, is a moderate estimate:—

36,000,000 gallons of fine oil at 75 cents	£5,400,000
864,000,000 lbs. of oil-cake at 1 cent..	1,728,000
106,000,000 lbs. of soap stock at 3 cents	636,000
Total estimated value.....	£7,764,000
Or, allowing a deduction of one-third to satisfy all objections	2,588,000
Leaving a gross amount of..	£5,176,000

It will be remarked that in this statement the value of the fibre obtainable from the bark of the plant itself has not even been mentioned, although, from the rough specimen which I hold in my hand, some opinion may be formed of the importance which this product may hereafter attain, seeing that there are

certainly seven millions of acres now under cotton cultture alone in the United States.

I think this brief allusion to these auxiliary products is sufficient to show that they should by no means be overlooked in estimating the returns from a cotton plantation in America or elsewhere.

THE CULTURE AND PREPARATION OF UPLAND COTTON.

The American planter always prepares his land with the small plough usually drawn by one or two mules or horses, which are trained to walk very fast. The person holding the plough, being either a negro man, woman, or boy, who generally works the same animals every day, is responsible for their treatment, and teaches them to behave in the most docile and intelligent manner, whilst they themselves become exceedingly expert as ploughmen (or women as the case may be).

In many cases, in fact, I may say in the vast majority of cases, where the planter has to deal with poor soil, he infinitely prefers employing his land every other year, or every third year, rather than going to the trouble and expense of manuring it, nor does he, except in rare instances, take the least care of the fields lying fallow, consequently they generally present a picture of the utmost untidyness and neglect, covered with weeds, amongst which a few cattle strive to obtain a scanty picking.

The preparation of the lands commences in November, and continues until March and April, when the sowings take place.

The land having been ploughed and harrowed down, is then again ploughed and thrown into ridges or beds, from 2 to 2½ feet broad, the tops being neatly levelled or smoothed by a one horse implement termed a sweep.

The sowings are made as early in the season as the frosts will allow, in order to get all the land planted in good time, and to have the crop in as forward a state as possible. In this, however, there is always more or less risk, for late spring frosts may come and all the young plants may be cut off in a single night, entailing the necessity of resowing the whole of the fields. Thus, last year many planters in South Carolina, Georgia, and other states, had to re-sow as late as May. So very tender is the young cotton plant.

The manner of sowing the seed varies according to soil and locality, or according to the peculiar ideas of the planter; thus the distance of the rows, from centre to centre, ranges from three feet to four-and-a-half feet; whilst some deposit the seed in furrows opened by a light plough, and others carefully dibble in their seed at exact distances apart. This latter method is practised on the estate of my friend, the ex-Governor of South Carolina, where I chiefly resided, and this mode I will therefore more particularly describe, as he speaks in high terms of its superiority.

The beds having been formed, as above noticed, a gang of men (taking each a row) proceed rapidly along, striking their dibbles (so called) into the centre of the beds, at exact distances of 12 inches apart. A second gang (generally women) deposit five or six seeds in each hole or indentation made by the dibbles, and a third gang (generally young boys and girls) follow with light hoes and cover the seed with soil, thus completing the operation.

This may seem to many a very roundabout method of accomplishing this apparently simple matter, but it must be remembered that upland seeds are not only furred by the cotton lint still remaining on them, but they stick so together that their delivery, even by the most ingenious drilling machine, is held to be very uncertain and unsatisfactory. Moreover I can say, from actual experience, that the rapidity with which these trained negroes get through the work is something truly astonishing, and only to be appreciated by those who thorougly understand such operations.

The seed being sown, the greatest possible care is taken to prevent the growth of weeds, for if these once get the upper hand, the crop is either seriously injured, or entirely destroyed; hence this is a pretty hard time for the negro labourers, who with light and sharp hoes, have to do unceasing battle with the enemy until the young plants have reached certain size and strength. These weeding gangs also from time to time cut out the weakly plants, until at length only two, and these the strongest are left in each hole. Supplying, or re-sowing the holes that have failed to produce plants, likewise occupies attention.

It is always the object of the planter to perform as much of his work as possible by means of his horses, mules, ploughs, sweeps, &c., and as little as he can by mere hand labor; but the weeding of the very young and tender plants is an operation too delicate to be performed with any safety or nicety altogether by ploughs or sweeps; although I believe some "very smart" planters do occasionally boast that they never use such a thing as a hoe in their cotton-fields.

It is an undoubted fact, which I unhesitatingly vouch for, that the negroes in the Southern States are altogether unequalled in horse or mule husbandry; and I assert that the rapidity, efficiency, and the precision of their work, is infinitely beyond anything that is dreamed of in this country:—but we must well understand, that this excellence in work arises from the *unceasing training of a life-time*, under the watchful eye of those whose lessons are very sharp and striking, and who will listen to no excuses. They must work well, and they do.

It is usual in the States to calculate the crop at so many acres to the working "hand," (as the slave is denominated); thus a cotton planter with 50 good working hands (great and small) and 25 mules, would consider his strength equal to 500 acres of cotton, and 400 acres of corn, or to 1000 acres of cotton alone, provided extra hands were allowed to help in picking in the crop. This is the general mode and rate of calculation, where the soil yields about 200 lbs. of ginned cotton to the acre; making therefore to the hand, 2000lbs. of cotton, which at 5d. per lb. on the spot, is worth about £40 sterling, besides the value of the Indian corn raised.

The whole cultivation of the cotton plant, up to the period of its first "picking," is termed "making the crop," therefore a planter will say "my crop is made, so that part of the business is over."

It must not, however, be supposed that crops arrive at this stage without very frequently encountering many and serious trials; on the contrary, the cotton plant has many enemies, such as the cut-worm, the army-worm, grasshoppers, &c., &c., whilst too much rain, or a long-continued drought, does it great injury; and certain moths deposit their eggs in the very young and tender bolls, which are thereby partially or wholly destroyed, and this sometimes occurs to an immense extent.

If the season has been forward and favourable, the "picking" may begin in August; but if backward, the first general picking may be delayed until September. In uncommon cases, in some districts it may begin as early as July; but when-

ever it does commence, the chief dread of the planter is an early frost; for until a killing frost does occur, the plants continue to produce and ripen their bolls.

During the picking season, as may be supposed, the utmost activity prevails, every available "hand" goes to the field; and the shorter the individual the less will his or her back be tried, for cotton picking generally is rather a back-aching employment.

Each picker takes a bag (tied round the breast or waist) and a good sized cotton sheet; the former he fills with the cotton he picks, which he then lays out on the latter to dry, whilst he is re-filling his bag, and so on until his sheet will hold no more, when he carries it to the weighing house, and returns for another lot.

A good careful hand will pick in a fair field 200lbs. of seed cotton in a day; but to accomplish this quantity, he or she must be a "right good hand," unless the cotton is unusually thick on the bushes. I have, however, heard it frequently affirmed, that in the teeming valley of the Missisippi, the hand not uncommonly picks from 400 to 500 lbs. a day, but it must be killing work, and the cotton so picked must be very foul.

Successive pickings, each being less in quantity, at length so exhaust the cotton on the bushes, that there is no longer any left to pay for further picking; the cattle are then turned in and speedily destroy the bushes, and the land is left in this condition until required some succeeding year either for corn or cotton again.

In the valley of the Mississippi, the common average yield per acre of ginned cotton is one bale of 400 lbs., whereas in South Carolina, Georgia, &c., 200 lbs. is considered a very excellent return per acre, much of the land not giving even 100 lbs. per acre.

There is, however, abundance of rich land in all these States, which will yield 400 lbs. to the acre; but being low lying, the cotton is liable to mildew, to be injured by wet, and to be killed by early frosts; whilst, at the same time, they are very unhealthy; hence such lands are preferred for corn and rice.

Some upland cotton plants, under favourable circumstances, are wonderfully prolific, producing from 300 to 400 bolls per tree, weighing 4½ lbs. of seed cotton, equal to about 1¼ lb. of ginned cotton. Indeed, intelligence has just reached me from the southern States that a planter at Oxford, in Georgia, has, by judicious management of his seed, succeeded this year in obtaining a plant which, although only 4½ feet high, ripened 420 bolls, yielding nearly 5 lbs. of seed cotton. From this it may be imagined how very greatly the produce per acre may be increased by a good selection of seed, and by a careful attention to the due preparation and manuring of the land, instead of having a large straggling cultivation, unmanured, and miserably neglected.

Picking cotton is no doubt considered by many to be a very easy and simple operation, but, in reality, to pick cotton properly is a very nice and delicate business, inasmuch as it is essential to withdraw every particle of cotton from the boll at one pull, without getting any leaf, scraps of leaves, or other foreign matter clinging to it. By dexterious management, so as to grasp lightly with the fingers the five sections comprising the boll, and withdraw at once all the cotton in it, the rapidity of the picking is insured; whereas, by making two, three or four efforts, but a small quantity would be gathered in the day's work, and the unskilful hand would cut but a very sorry figure at the weighing-house in the evening. By obtaining it free from small fragments of leaves and of the boll itself, the cotton is clean, and consequently entails little or no trouble in getting rid of these extraneous matters prior to being ginned.

Great rapidity and care are therefore qualities essential to form a good cotton picker, and the strictest supervision is exercised in enforcing them. Apart from all this, however, the pickers very frequently get sore hands in the picking season.

But the most annoying and distressing circumstance under which the "hands" labour, is the wetness of the bushes in the cold autumn mornings, caused by heavy dews at night. This wets the people's clothes, and often leads to colds, influenza, rheumatism, &c., which recently some planters have sought to remedy by providing waterproof aprons or skirts to be worn by the hands.

Wherever the strength of the estate will allow it, the hands are put to other occupations in the morning, until the sun has partially evaporated the moisture on the bushes and on the cotton, when they commence picking; but in the cold frosty mornings the sun only thaws the moisture, and the pickers generally get both wet and cold. There are numerous plantations, however, so pressed for time that the hands are kept at it dew or no dew; althougn the planter by no means likes it, for the cotton picked is in a very damp state, subjecting it to great deterioration; whilst the hands run great risk of sickness and death.

A comparatively dry season, with only a few showers now and then, is that most favourable for cotton picking, and that for which the planters most earnestly long.

Immediately a sufficient quantity has been picked and ginned, it is packed in bales (under considerable pressure) and sent into town, the planter being only too anxious to convert the first of his produce into money; thus, from the month of August, waggons are constantly on the road, loaded with the standard "currency" of the south, and, by November the crop should be all baled and sent to market, where, in general, it is sure to meet with a ready sale.

This facility of sale is the main reason for the planters clinging so tenaciously to the cultivation of cotton, for they always feel that, with a few bales of cotton in hand, they can obtain money at any moment by making the very smallest possible sacrifice, or perhaps without any sacrifice whatever.

Besides this, the culture is so well-understood by their hands, and the preparation of the cotton for market is so exceedingly simple. Indeed, this preparation consists merely in passing the seed cotton through the ginning machine to separate the seeds, and then pressing the lint into bales of about 400 lbs. each.

Two machines (costing each from £16 to £22) will gin a crop of from 300 to 500 bales, and the screw press, which costs only £30 to £50 when made on the plantation, is able to compress 30 bales a day.

I have spoken of short staple, or upland cotton, but it must be understood that there are endless varieties (so-termed) of short staple cotton, which it would be tedious and out of place for me to speak further of here; suffice it to say, that it is on the sea islands and sea coasts alone that the long staple can be advantageously grown, whilst the short staple has the whole range of the vast interior of all the Southern States of the Union.

Before quitting the subject of short staple cotton, I wish to mention a particular description, which is grown in the island of Cuba, where it is chiefly used for making the wicks of lamps on

sugar estates—being of a very coarse and inferior quality. The pods or bolls are, as will be seen from the specimen now in my hand, of enormous size; the plants grow into considerable-sized trees, attaining, very generally, a great age, and are remarkably prolific. I regard the cotton more in the light of a curiosity, for I do not, at present, see that any great commercial value can be attached to it, although we do not yet know what effect might be produced by crossing it with a finer description of the cotton plant.

LONG STAPLE COTTON.

The long staple cotton which fell under my observation in the United States, is that commonly known as "Sea Island," from being generally grown on a multitude of small islands on the sea-coasts of South Carolina and Georgia; but now it is, I believe, extensively cultivated in Florida, Louisiana, and Texas also.

Removed any distance from the coast-line, this cotton, I am told, immediately degenerates, and becomes short in its staple and wretchedly poor in its yield; hence we may consider its only congenial locality as being the very shores of the sea.

The chief Sea Island region of South Carolina lies between Charleston and the great Savannah river, which separates that State from Georgia; and of this region, the island of Edisto has the reputation of producing the finest and most valuable.

The very small specimen now in my hand, was given me as being part of a bale the production of that island, which sold for one dollar and a quarter (rather more than five shillings) per lb. to a French buyer, for the purpose of being worked up into lace in France, and I heard of a small sample being at that time in Charleston which was valued by the best judges at one dollar and a half (more than six shillings) per lb.; but this was said to have been grown in Algeria from American seed.

It must be understood, however, that these prices, in America, are considered extremely high, and of most unusual occurrence, the more usual qualities and prices being much lower. Such extraordinary prices as these are scarcely to be wondered at, when we know that one lb. of this fine cotton has been spun into thread, 1000 miles in length, which, when made into lace, has sold for upwards of £250.

I shall now proceed to touch on the culture and preparation as pursued on the sea islands.

The preparation of the land and the throwing up of the beds for the plants, very much depends upon the peculiar situation of the fields and the nature of the soil. The land may lie low and be very much impregnated with salt, from the occasional influx of a very high tide, or it may be somewhat swampy from a superabundance of fresh water; again, it may be a very light and sandy soil, or it may be a pretty stiff clay, or, varying from all these, it may be a nice warm loam, lying high and dry, above the influence either of tides or of freshets. According as these conditions vary, so, to a certain extent, does the practice of the planter. In low-lying lands, very light drainage alone is practicable, hence, when they are of a clay soil, these are liable to be, at all times, cold and trying to the plants, keeping them sickly in appearance and backward in their growth. In such cases it is usual to ridge very high, to plant thin or wide apart, and to give the warmest manures available. The spaces between the ridges act as so many superficial drains to carry off the superfluous water to the main drains. These ridges are mostly thrown up in the first place by means of suitable ploughs, and finished off by the hoe; and indeed, throughout the whole culture or "making of the crop," there is a great deal more hand-labour than there is on the upland plantations, and infinitely more care bestowed. On higher lying and drier lands, such heavy ridging is not required, although I remarked that the system of ridging is, to a certain extent, universal on all the Sea Island plantations.

In all their operations, horse or mule labour is always availed of, as far as possible, in order to abridge hand labour; but the very nature of this cultivation necessitates a recurrence to the human hand, to so great an extent as to limit very materially the quantity of land sown every year by each planter. The produce is so much more valuable than upland cotton, that 200 acres of the one properly cultivated, will, on an average, represent in money value 1000 acres of the other, consequently, the Sea Island planter can afford more time and more expensive labour than his brethren of the interior.

Notwithstanding this, there is not that amount of good and scientific cultivation apparent on these plantations generally, which, from the valuable description of the produce, a fastidious Englishman would expect to find. There can be no question that the fields planted in cotton are very clean and very carefully kept; but those lying fallow are covered with a profusion of tall weeds and troublesome grasses, which shed their seeds, and having impoverished the soil, leave behind them a legacy of labour and vexation to the planter.

I was so struck by this seeming folly, that I inquired of one of these gentlemen why he did not "green soil" these lands, instead of abandoning them to weeds and desolation. His answer was eminently characteristic of the state of feeling and state of things there existing. "It is very well for strangers to ask such questions, and to wonder that they do not see amongst us that high class condition of agriculture which is to be found in the north, and in England; but remember, my dear sir, that we, too, have our experiences, for which many of us have paid pretty dearly. Most of us have been established here upwards of 100 years, and have from time to time tried manuring green soiling, clean fallows, and all the other methods pursued and recommended in England, but we have always found that with the soil and climate we have, and our negro labour, we succeed better by keeping to the system which seems so unthrifty to you. Besides, we have not sufficient labour, nor mules to plough up more land than we absolutely require each year to plant in cotton, corn, and sweet pototoes; so we content ourselves with giving to our land such manure as we can make and collect ourselves, and are only too happy at knowing that we are on the right side of the hedge, and not getting into debt and difficulties."

The experience of many years in various countries has taught me the presumption of despising any local practices which for many long years have proved successful, however opposed such practices may be to all my own ideas; still I think that, were I a Sea Island cotton planter, I should try what might be accomplished by a change of system.

Great numbers of these island plantations have large stores of manure, in the shape of rotten reeds, flags, marsh, grass, &c., brought to their very fields by numerous intersecting rivers, creeks, &c., besides the quantities of rich, saline mud, intermingled with small shells, which they likewise furnish. Most planters

avail themselves largely of this bounteous supply, and thereby add very greatly to the fertility of their lands, and of course to their return per acre. I was much astonished at the very saline character of the soil in which I saw much of this cotton thriving; and I think it quite worthy of note, that I saw in many places large tracts of land, which had, perhaps, but a year or two previously been quite covered by the salt water of one or more high tides, and which still retained so much saline matter as to be apparent even to the eye, but which were nevertheless covered with the most luxuriant growth of bearing cotton. I also saw other tracts quite denuded of all vegetation, save a few saline plants, and which appeared to be little better than a salt marsh, but to my surprise I learned that in a couple of years they, too, would be growing just as fine cotton as much that I had seen. I must confess I had no previous conception that this valuable cotton would even grow at all on such highly saline soils; and had I not seen it myself, I should have been somewhat incredulous of the fact. As it is, I do from actual experience vouch for it as undeniably true.

I cannot see any difficulty in sowing this description of cotton seed by means of a drilling machine, for the seeds are perfectly smooth, and consequently easy of delivery; in fact, many plantations always employ a machine, called a "cotton planter," which dispenses with the number of hands usually employed in dibbling on upland plantations.

The sowing being effected, all the after operations in the field, such as weeding, moulding, banking, or ridging, are successively performed, entailing as I before remarked, no inconsiderable amount of hand labour.

About July or August the picking commences, and continues until November generally, unless severe frosts occur earlier.

If rapidity and care are imperatively required in picking the short staple variety, it can well be imagined that extreme care and attention are demanded in gathering in the delicate and valuable "Sea Island." Rapidity of work is by no means so essential as great cleanness, for the object is to preserve the quality, and thereby maintain the established reputation of the particular plantation. Upon this reputation depends not only the price, but the very sale of the cotton, for it must be understood that this description of cotton, being employed only for particular purposes, does not meet, by any means, so ready a sale as the short staple; indeed, not unfrequently a planter cannot sell his crop at all, and is obliged to ship it to England at all risks.

Its picking, and every step in its preparation for market, receive, therefore, the utmost care and attention. When it has been picked, the first object is to get rid of any superfluous moisture it may contain without drying it too much. It is then picked over, to get rid of all motes, and discoloured particles of cotton, which sometimes, from insects boring into the bolls, and from other causes, get mixed up with the mass.

This being satisfactorily performed, it is kept in heaps sometimes five feet high, four to five feet broad, and twenty feet long, and covered over with cloths. The object of this is to preserve the oiliness, strength, and gloss of the fibre (which a lengthened exposure to the air would destroy), until an opportunity offers of selling it, or it is necessary to send it to market. But by thus keeping it in heaps, the liability to heat must be attentively watched and guarded against, for whenever it gets too warm, the heaps must be immediately opened out, and the cotton be carefully spread on the clean swept floor of the cotton house, to be again replaced in heaps as soon as it has become perfectly cool. If the heaps become hot, in a very brief space of time the oil contained in the seeds oozes out on the fibre, and imparts to it a dirty yellow colour, which rapidly changes into a brown, and thus destroys its commercial value: but many planters do not object to its becoming very slightly heated, esteeming it an advantage rather than otherwise, inasmuch as they consider that the fibre extracts gradually some of the oil from the seeds, and the eby becomes stronger, softer, and more silky, whilst at the same time it acquires a very delicate shade of yellow, such as experienced buyers admire.

But the time has now arrived for separating the fibre from the seed, and here we become aware of a very remarkable fact—one which completely astonished me. I found that the machine chiefly used for this purpose was no other than the little, humble, and despised roller gin of India—the veritable *churka*.

This little implement consists of two wooden rollers, of about 8 to 9 inches long and one inch in diameter, placed horizontally and in contact, one above the other, and revolving together, drawing the fibre of the cotton through and leaving the seed behind. In Carolina the motion is communicated by a treddle, worked by the foot, whilst the feeding is by hand as in India.

By means of this little machine 12 lbs. to 20 lbs. of cotton are prepared in a day, and that is considered fair work; but my scientific and esteemed friend, Mr. Robert Chisolm, of Coosaw plantation, has applied steam power to give motion to all his roller-gins, or *churkas*, and this gets through a very great deal more work per hand daily.

So exceedingly sensitive however is the market for this peculiar description of cotton, and so cautious are the planters that those who grow the very finest kinds will on no consideration deviate from the beaten track, nor employ any other machine than the little, simple, old-fashion churka, actuated by the treddle.

These gentlemen maintain that the rapid motion given by steam, not only heats the fibre, but strains and even breaks it.

This assertion Mr. Chisolm, on the other hand, utterly denies, and instances his own large crop, which always maintains the current prices. There is, however, another, and a totally different machine (known as "McCarthy's"), which is now coming into very extensive use amongst the growers of second and third-class Sea Island. One extensive planter (who has on his plantation eight of them worked by steam-power) told me that his cotton fetches the same price now that it did when he used the churkas, and so great is the advantage derived from their use, that he would rather abandon cotton cultivation altogether than go back to the use of the little fiddling roller-gins or churkas.

I must say that such an opinion, so emphatically expressed by a large planter of great experience, and perfectly disinterested, had very great weight in my mind, and I was pleased to find this opinion extensively confirmed afterwards. I have moreover heard gentlemen assert that they have prepared samples of the same quality by the roller-gin and some by McCarthy's machine, and then submitted them to all the first-class brokers in Charleston, none of whom could tell which was by the former, or which was by the latter; and this experiment they told me they had tried on the finest Edisto cottons with precisely the same result.

Now I hold this to be important evidence for

us in all our future operations, the more especially as one of these singular machines, steam driven, can turn out 500 lbs. of clean cotton per day. I have not ventured to speak of its performances in my own presence, for although I might do so as respects quantity, yet my eye is by far too inexperienced in this speciality to be a competent judge as to quality.

Machines precisely similar to these, but, I presume, smaller, are made in Manchester by Dunlop and Co., at from £7 to £10 each; whereas the large ones of South Carolina cost £20 to £24 each, including patent right; or £15 without the patent right.

There are several other kinds of machines in America for separating the seed from long staple cotton, all of which are very highly praised by their inventors, owners and friends, but as I did not see them at work, and have no reliable evidence to offer respecting them, them must abide their time.

When the cotton has been cleared of its seeds, motes, and discolored particles, it is then pressed down very tightly into long round bags, quite different in form to the bales of upland cotton; and it is never subjected to such great pressure as it would receive in a screw-press, for that would very seriously injure its fibre.

After his produce is all fairly bagged, the difficulties of the planter are not ended, but, as I said before he has sometimes considerable trouble, and to wait a long time before he can find a buyer for it, and not unfrequently he has to ship it to Europe, and encounter all its manifold risks and chances.

This, indeed, constitutes the greatest disadvantage under which he labours. The Upland cotton planter makes his bale of cotton to-day, and tomorrow he has cash in hand for it; or perhaps he is even paid for it before it has left the trees; not so, however, with the Sea Island cotton planter, he is obliged to exercise all his patience before he can sell his crop, and in the meantime, although lord of 200 to 400 slaves and fine estates, he is very probably compelled to use his broker's name in obtaining cash from the banks wherewith to pay the current expenses of his estate.

It must strike every one as a singular feature in the banking system of Charleston, that a broker, who may be a mere man of straw, can get his bills cashed at the banks, whereas, those of a really substantial planter, owning large and most valuable properties would not be looked at; yet, such is the practice of these banks. I presume that there must be some good and sufficient reason for this, but I certainly failed in discovering it.

I have already stated that the Sea Island furnishes a larger proportion of seed than the Upland or short staple does; and I think we shall be correct in estimating it at four pounds of seed to one pound of fibre. These seeds are black, smooth, and clean, yielding a fine oil and excellent cake; whilst the bark of the plant furnishes a much better fibrous material than the Upland variety; this specimen being from a Sea Island plant.

It is necessary for me to remark also, that long staple cotton is not so prolific as the Upland varieties, consequently the quantity of cotton obtained from the acre is very much less.

200 lbs. of clean cotton seems to be the maximum, whilst some fields do not yield 40 lbs.; the hands therefore pick smaller quantities per day than on Upland plantations, and the picking seldom ceases until the trees are entirely stripped of their delicate and silken fibre.

Such, then, is Sea Island cotton planting; but I cannot take leave of these beautiful Sea Island plantations, without remarking upon the warm-hearted hospitality, unaffected kindness, nice sense of honour, and gentlemanly deportment of those proprietors with whom I had the pleasure of becoming acquainted during my visit to Beaufort and its neighbourhood in November 1857.

PROVISION CROPS.

The general rule on cotton plantations of all kinds, is to cultivate a certain quantity of Indian corn, rice, &c., for the food of the white people, the negroes, the mules, horses, horned cattle, and other stock belonging to the estate; but some planters grow very large quantites for sale also. A friend with whom I resided, in addition to his cotton crop of 275 bales, gathered in whilst I was with him 61,000 bushels of corn, of which he would use on his plantations, about 11,000 bushels, leaving 50,000 bushels for sale.

It must be understood that most planters allow 3 lbs. of bacon a week to each negro on the plantations, man, woman, and child, besides corn meal, molasses, tobacco, &c,; consequently it is not uncommon to kill and cure 400 to 500 hogs every year on a plantation having 300 to 400 hands all told.

I knew one planter with about 600 hogs, and the quantity of corn this herd of swine would dispose of was no small item at the end of the year, but all "this hog" was for the use of the plantation only, none being sold.

This brief explanation renders clear the practice of growing such large quantities of corn on most cotton plantations; but I may add, that from a variety of causes, many of them exhaust their stock, and have to purchase from their neighbours, who may have been more fortunate or more provident.

LABOUR.

Having thus touched on all the subjects most interesting in the culture and preparation of cotton, it is now essential that I should submit to the society my views on that great, and I must say, little understood, question, viz., that of labour, such as the slave gives his master on the cotton plantations, and that which can be calculated on by Englishmen from the free men to be found in the colonial possessions of Britain.

In doing this, I beg to remark, that I shall endeavour to consider the subject in a strict business point of view, feeling convinced that a really practical and scientific body of men must always prefer dealing with plain facts and figures.

The money-value of an individual slave can only be arrived at from a due consideration of his, or her, age, health, strength, freedom from blemishes, temper, capabilities, &c., &c.; but working hands, of all sorts, sizes, and ages, on a plantation, may be fairly estimated as being, on an average, worth 800 dollars, about £165 sterling each person.

Considering the liability of loss by death, or disabling by accident, I do not think £16 per annum, as interest, will be considered unreasonably high. Add to this the cost of food, clothing, medical attendance, and small allowances, which on every well ordered plantation amount at least to 40 dollars, or about £8 per annum, and we find that the real cost of slave labour is about £24 per annum.

I will vouch for the general accuracy of this calculation. Let us then take this sum as the cost of slave labour, and next inquire what kind of labour it is that the planter obtains for his money? To comprehend this thoroughly we must consider that from childhood, the slave is constantly under the eye, not only of his master,

but likewise under that of men of his own class, named "drivers" who are selected for their intelligence, their trustiness, and their thorough knowledge of plantation work; each day brings with it its lesson, which he must learn, and each year finds him improving in his work, and becoming more and more capable in the various duties assigned him.

His master's plantation is to him at once a home and an industrial school, in which the reins of government are held pretty tightly; into which he enters in early boyhood, and continues, ever learning, until old age, sickness, or death removes him.

It must be remembered that whatever occupation he may be put to, he is obliged to learn it thoroughly and to perform it well. That self-same stimulant which is sometimes so vigorously applied in our schools to brighten the faculties of our English boys, is also resorted to on plantations, but with more method and more severity. One of the primary lessons inculcated on the mind of a juvenile "hand" is, that if he does not perform his work properly he will be whipped; and when he has once mastered this lesson, and becomes positively certain that a good whipping will inevitably follow bad work, he has already gained an experience which will save him from many flagellations. In short, he takes good care to avoid punishment if possible, and by so doing becomes a good and skilful labourer.

Now, this training goes on from day to day, and from year to year, without cessation and without the smallest relaxation of discipline: would it not be wonderful then if labourers so trained and superintended did not become most handy, skilful, and efficient workmen? I think every one will admit the truth of this, and will be fully inclined to believe me when I repeat that they are indeed most efficient and valuable labourers; that they thoroughly understand every branch of their work, and perform it in a highly intelligent and workmanlike manner.

(To be Continued.)

METEOROLOGICAL TABLE.

FEBRUARY, 1859.

OBSERVATORY, SYDNEY, LATITUDE 33·52 SOUTH; LONGITUDE, 151·12 EAST HEIGHT ABOVE THE SEA, 145 FEET.

Day.	Barometer corrected to 32 deg. Frnht.		Wind. Direction.		Force.		Temperature. Max.	Min.	Cloud Extent.		Rain in Inches.	Remarks.
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M.	9	9		
1	29,797	29·852	S.E.	S.S.W.	3	3	72·1	63·2	10	10	1·550	Raining nearly all day
2	·928	30·035	S.S.W.	E.S.E.	2	1	72·8	62·0	10	10	1·365	Heavy showers; sunshine occasionally
3	30·024	·037	S.S.E.	0	1	0	74·0	63·4	8	0	·580	Cloudy; cleared at sunset
4	29·966	29·866	W.N.W.	N.N.E.	1	2	77·0	56·3	0	0	·002	Fine throughout
5	·878	·837	S.S.W.	E.S.E.	2	1	80·4	58·6	1	2	...	Fine throughout
6	·826	703	E.	E.S.E.	1	1	81 0	65·5	0	0	...	Fine throughout
7	·720	·670	N.W.	E.	1	2	96·0	65 0	0	0	...	Warm and clear; wind to S. 10·30 p.m.
8	·676	·572	0	S.S.E.	0	3	90·1	66·8	0	1	...	Fine; heavy cloud and lightning to S. at 9 p.m.
9	·465	·482	N.	S.S.E.	1	2	80·2	67·4	7	1	...	Cloudy; thunder S. at 10 a.m.; cleared 8 p.m.
10	·717	·788	S.	S.E.	4	1	79·1	61·6	4	10	...	Cool cloudy day
11	·754	·516	N N E	N.E.	2	5	75·0	61 7	2	5	...	Strong N.E. wind all day
12	.556	·610	W.N.W.	S.W.	1	1	91·0	67·9	0	0	...	Warm calm day; 9 p.m. lightning to E.
13	·745	·829	W.N.W.	E.S.E.	1	1	83 5	60·2	0	0	...	Fine throughout
14	·816	·629	E.N.E.	0	1	0	77·8	60·9	3	9	...	Fine throughout; heavy dew
15	·624	·701	S.S.E.	S.	2	3	79·7	66·3	1	10	...	Strong squalls at intervals; heavy shower 1·3 p.m.
16	·781	·813	S.	S.	3	3	72 2	64·7	10	10	·035	Rain began 6·30 p.m.; squally
17	·871	·918	S.S.E.	S.S.E.	2	3	68·7	58·4	10	10	·785	Rain at intervals
18	·905	·914	S.E.	S.E.	1	2	67·9	58·2	10	10	1·545	Raining nearly all day
19	·924	·821	S.E.	S.E.	2	1	74·0	61·2	6	7	·645	Cloudy; occasional sunshine; heavy dew
20	·934	·875	W.N.W.	E.N.E.	1	1	76·1	57·7	2	1	...	Fine throughout; heavy dew
21	·832	·696	0	N.E.	0	4	74·5	59·5	3	0	...	Fog in the morning
22	·604	·386	W.S.W.	N.E.	1	3	78·7	64·9	2	1	...	9 p.m. thunder storms S. and W.
23	·386	·468	W.S.W.	W.	1	3	73·9	63·1	8	9	·050	Thunder showers from 7 a.m. all day
24	·512	·626	W.N.W.	W.N.W.	2	1	77·0	58·0	2	1	·123	Fine; cloudy afternoon; clear night
25	·702	·794	W.	0	3	0	80·1	57·0	0	0	...	Fine throughout
26	·833	·954	N.W.	S.	1	2	77·0	55·9	0	10	...	6 p.m. wind to S.; light showers 9 to 11 p m.
27	30·026	30·061	E.S.E.	E.S.E.	1	2	73 4	62·5	10	9	·001	Fine; clouded over after sunset
28	·102	.057	E.S.E.	N.E.	1	4	72·3	62·3	10	5	·535	Showery morning cleared in the afternoon.
Mean.	29·782	29·774			1 5	2.0	77·7	61·2	·61	·47	7·216	Days Rain—1.

The Black Bulb Thermometer is now placed about 4 inches from the ground, and protected from the wind.
The extent of clouds is represented by the number of tenths of the whole sky, obscured at the time of observation.
The force of the wind is represented according to the Observer's judgment, by numbers from 0 to 6, 0 representing a calm, and 6 a violent storm.

HEALTH OF SYDNEY.

Registrar General's Office,
Sydney, 7th March, 1859.

The number of Deaths registered at the Central Office, during the month of February, was 21, viz.: 71 males and 50 females, 54, or 44·62 per cent being under five years of age. It is satisfactory to observe, that the Scarlatina epidemic, which has carried off so large a proportion of the children under 5 years of age, during each of the last four months, has in a great measure subsided, there being only 9 cases recorded during the month of February.

The number of Deaths registered during the corresponding month of previous years, was as follows :—

1857	105;	per centage under 5 years	54·28.
1858	125;	do. do.	52·00.
1859	121;	do. do.	44·62.

The number of Births registered during February was 208 viz.:—115 males and 93 females, being 87 in excess of the Deaths.

Table shewing the Deaths of Males and Females Registered in each Ward from 1st to 28th February, 1859, *distinguishing those under 5 years of age.*

WARD.	Under 5 Years.			Above 5 Years.			Unspecified.		Grand Total.
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	
1.—Gipps	4	4	8	4	4	8	...	...	16
2.—Bourke*	4	2	6	16	8	24	...	...	30
3.—Brisbane	2	4	6	4	1	5	...	...	11
4.—Macquarie	2	1	3	3	1	4	...	...	7
5.—Cook	7	3	10	4	3	7	...	...	17
6.—Fitz Roy	7	1	8	5	4	9	...	...	17
7.—Phillip†	3	4	7	2	2	4	...	...	11
8.—Denison	1	5	6	3	3	6	...	...	12
Total	30	24	54	41	26	67	...	...	121

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

Summary of Deaths of both Sexes Registered in Sydney, from 1st to 28th February, 1859.

Causes of Death.	Under 1 year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10	10 and under 15	15 and under 20.	20 and under 25.	25 and under 30	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all ages.
Zymotic Diseases. Endemic, Epidemic, and Contagious	7	8	2	1	1	19	2	1	1	...	1	2	...	...	...	...	1	1	1	...	...	...	...	...	...	...	29
Sporadic Diseases. *Of Uncertain Seat,*—Dropsy and other Diseases of variable Seat.	7	2	...	1	...	10	...	...	...	...	...	2	...	1	2	2	...	1	...	...	...	...	...	...	...	...	18
Of Nervous System.—Diseases of the Brain, &c.	9	7	...	...	...	16	...	...	...	...	2	1	...	1	2	...	...	...	2	...	...	...	...	...	...	1	25
Of Respiratory System.—Diseases of the Lungs, &c.	...	1	...	...	1	2	...	...	...	3	1	1	1	1	3	2	...	1	...	...	...	...	...	...	...	...	15
Of Circulatory System.—Disease of the Heart and Blood-vessels	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	3
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	3	2	1	...	...	6	...	1	...	1	1	..	2	...	...	...	...	...	...	...	...	...	...	...	...	...	17
Of Urinary Organs.—Diseases of the Kidneys, &c.	...	...	...	...	...	...	...	...	...	..	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Of Generative Organs.—Childbirth, Diseases of the Uterus	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1
Of Integumentary System.—Diseases of the Skin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Old Age	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	3	...	...	1	...	...	5
External Causes.—Violence, Privation, and Intemperance	...	...	...	1	...	1	...	...	1	1	...	...	2	1	...	1	...	3	...	...	...	...	...	...	...	...	10
Unspecified	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Total from all Causes	26	20	3	3	2	54	3	3	2	5	7	7	6	4	7	6	2	6	3	1	3	...	...	1	...	1	121

CHRIS. ROLLESTON, Registrar-General.

ON THE SUPPLY AND PREPARATION OF FOOD.

It is impossible to exaggerate the importance of the question on which we now propose to offer a few observations. A bountiful Providence has done much to sustain the life of man in giving gratuitous supplies of light, air, and water, but man has to labour to provide himself with food, clothing and shelter.

The chief of these necessaries is, of course, food, for it is universally felt; the two others depend much on climate, and in some countries are not absolutely essential to sustain the life of uncivilized man. In the savage state man has to labour to provide himself with food even of the rudest kind, but as civilization increases, the labour of each individual becomes less in consequence of the intelligence and combination applied to its production and the gradual increase which takes place in the natural wealth of the soil; by the planting of the earth and the increase of the flocks and herds.

It would appear that Australia on its discovery by Captain Cook was one of the most inhospitable in the world, the aboriginal inhabitants being, the least intelligent and civilized. But even this barren soil has been made to bear fruit for the use of man in abundance, and now it is probable that its inhabitants live more luxuriously, taking the average of the population, than those of any country in the whole world.

It is desirable however to enquire whether this luxurious rate of living is likely to continue, for there are few things so difficult as giving up luxuries to which we have become accustomed, and the object of these remarks is to point out how our supplies of food may be econonomised.

Although we have no sympathy with the Protectionists we cannot help feeling some shame and regret that we, Australians, should depend so much as we do on foreign sources for the very food which we eat. How is it that we find it answer to send for potatoes from New Zealand and even from California, while bacon, cheese, pickles, fish, and a hundred other articles that we could produce ourselves are imported from abroad.

In Is it, as the political economists tell us, consequence of all the people being so well off that it will not pay them to produce these things? or is it for want of industry and enterprise on the part of the inhabitants? This question we cannot stop to answer here, and we must leave it with the expression of our belief that the political economists are right, that it results from the wealth of the population.

But it is stated that this wealth is rapidly diminishing and we shall soon be driven to depend more than we have done hitherto on the productions of our own soil. The rapid rise that has taken place in the last five years in the price of flesh meat and the increase in the cost of living, must drive some of the unoccupied hands in Sydney to become producers.

The Governor-General has plainly indicated his fears of the approach of hard times and has advocated the introduction of stall feeding to make the most of our present stocks of meat. In the present number we publish the result of an experiment of this kind made in Tasmania, to which we direct the attention of our readers. He has also recently, in connection with some public spirited individuals, fitted out an expedition at his own expense to explore the ocean which lies at our doors with a view to add to our resources by opening up fisheries. This expedition was not successful in meeting with any banks which the well known fish, such as cod, turbot, herring, mackerel, and soles, frequent, and did not demonstrate the probability of opening up a fresh branch of industry. But it is rather humiliating to to our pride as Europeans to find that the Chinese have succeeded in establishing a very profitable trade in catching and drying fish at various stations on the coast.

We have been informed on very good authority, that, at Broken Bay, Botany Bay, Port Stephens and other places, they have large and well ordered establishments and that they actually employ, at good weekly wages, a considerable number of European fishermen.

The produce of their fisheries is nearly all dried and smoked, and it finds a very ready and remunerative market at Melbourne, to which place it is conveyed in the steamers and the coasting craft. Those of our readers who recollect how often attempts have been made to estab-

lish Fishing Companies here, and how uniformly these attempts have failed, entailing severe loss on the promoters, will be able to estimate the difficulties of this enterprise.

It would be very desirable if some better organized plan could be devised for supplying Sydney with this nutritious and wholesome article of food.

Surrounded as the city is by salt water there could be no difficulty in constructing tanks communicating with the sea in which fish might be deposited alive, after having been brought in from the fishing grounds, in properly arranged well-boats. This plan would tend to cheapen the price of the article which is now enhanced by the impossibility of keeping such a perishable commodity. It is a remarkable thing that a city like Sydney should not possess a fish market for retail purchasers. We recommend the speculation to the attention of the Corporation, feeling assured that it would eventually prove a considerable source of wealth, more especially as meat is now so high in price and appears likely to be still higher.

The supply of vegetables to this market is also precarious, and they are scarce and dear, considering the great advantages of climate which this neighbourhood possesses, and the abundant supply of manure which may be had almost for the asking.

The Railway has not yet produced much effect in bringing in supplies from the surrounding districts. It would be worth consideration whether a very low tariff on all garden and farm produce should not be levied with a view of stimulating the formation of market gardens in the vicinity The English Railways have profited so largely by this kind of traffic that their example ought to be followed with strong expectations of success.

With regard to the bread supplies it does not appear that much can be done to increase our home production until the Railways have been pushed farther into the interior, where wheat can be grown to a profit.

In an article treating on the preparation of food we should not overlook the importance of Government inspection as a preventive of adulteration. It has been proved before Committees of the Legislature, that vast quantities of damaged flour are worked up and disposed of in some way or other for human food. This must be productive of much ill health and consequent loss to the community, for which it is the duty of the Government or the Municipality, to provide a remedy. As the Corporation have chosen to ignore the services of a Health Officer, the citizens appear to be left to the tender mercies of the tradesmen, and although many of these are highly respectable and conscientious men, the proved consumption of unsound and unwholesome flour remains to be accounted for.

In advocating interference of this kind, we wish it to be distinctly understood that we have no desire that Government should attempt to regulate price or supply. This is a matter far beyond their reach, as the Emperor of the French has doubtless discovered by this time, but we do desire that the poor should be protected from fraud in the same way that we advocate the enactment of laws for the regulation of the sale of poison.

On the purely domestic question,—the waste that takes place from the inartificial mode of cookery of food that is common in most English communities, enough has been written by abler pens than ours. We all know that Frenchmen can live luxuriously where Englishmen will starve. The frightful suffering that the British army in the Crimea went through for want of a little knowledge of the culinary art should teach us all a lesson not to despise this most valuable accomplishment.

In this colony the inhabitants labour under the disadvantage of having formed their tastes and acquired habits of living adapted to a much colder climate. The Englishman is proverbial for carrying the institutions of his native land with him wherever he may roam. Accordingly on an Australian Christmas day we see huge joints of hot roast beef placed on the table, although the thermometer may range at 90° in the shade. Indeed it is the universal opinion among medical men that the diet of the colonists generally includes far too much animal food. This must always be costly food in a warm climate, especially when it is so wastefully prepared as it is here.

There are few things more shocking to the feelings of a new arrival in the colony

than to see the immense waste of good meat that takes place in nearly every family. We earnestly wish that some competent person would take up this question and prepare an Australian Cookery Book. It would we are sure prove a paying speculation to the author, and we believe if the thing were well done it would be the means of saving thousands of pounds annually to the community. But it is not alone in its monetary point of view that it is important, the health of the colonists requires that more attention should be paid to their dietary. We firmly believe that much of the infant mortality that disgraces this city is to be traced to the absurd practice of feeding children on animal food which prevails. It may not go to the length that the *Times'* own correspondent asserted when he wrote home that the "babies of Sydney were fed on a diet of beefsteaks and brandy and water," but it is too true that a highly stimulating diet is the rule.

Homely and trite as the subject may seem, we reiterate our own belief that one of the great wants of the day is a system of cookery adapted to Australian life.

MEETING OF THE PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

WEDNESDAY evening, the 11th of May, the first meeting of the Philosophical Society of New South Wales for the present year was held in the newly-finished and commodious hall of the Australian Library, in Bent Street. Between forty and fifty gentlemen were present.

His Excellency having entered the Hall at eight o'clock, shortly afterwards took the chair, and, with a few brief observations, opened the proceedings. This was the first meeting of the Society for the present year, and the business before them that evening was principally to hear the financial statement of the treasurer, and to elect office bearers in place of those whose annual term was now at an end. During the past year the Society had held eight meetings, six of which had been chiefly devoted to the perusal of papers, and two of them to *conversaziones*. The number of members of the Society, appearing in the last printed list, was one hundred and seventy-four since which, during last year, twelve more had joined thus raising it to a present total of 186. There were, however, some other new members, whose names were proposed at the last meeting, and would prabably, in the ordinary mode, be that evening added to the list. Without further preface he should call upon the honorary treasurer to read the balance sheet.

The Honorary Treasurer then read the following Financial Statement for the year ending 30th April, 1859.

RECEIPTS.

Balance in the Union Bank on the 30th April, 1858.	£443	0	0
Entrance Fees	7	7	0
Annual Subscriptions	98	14	0
Interest from Government Debentures	20	0	0
Interest from Bank Balance	2	6	7
	£571	7	7

DISBURSEMENTS.

Purchase of Four Government Debentures of £100 each	387	3	6
Stationery and Printing	7	0	6
Advertising	7	2	9
Refreshments	19	15	0
Hire of Lamps and Tables	8	0	0
Carpenter's Work and Labour ..	4	0	0
Hire of the Hall of the Australian Library	12		0
Hire of the Sydney Chamber of Commerce..	16	16	0
Fifteen Copies of the Sydney Magazine at 15s.	11	5	0
Illustrations for the Sydney Magazine	31	7	0
Postage Stamps, &c.	0	16	9
Secretary's Salary to 31st December	40	0	0
Commission to Collector	8	4	0
Balance in the Union Bank	17	17	1
	£571	7	7

By Debentures £400
By Balance carried down £17 17 1

(signed) CHRIS. ROLLESTON,
Treasurer.

11th May, 1859.

The following gentlemen proposed at the last meeting, were duly elected ordinary members, viz:—

J. H. L. SCOTT, Esq.
SAMUEL BENSUSAN, Esq.

And four new candidates were nominated.

The Election of Officers for the year 1859-60 then took place with the following results—

President—His Excellency Sir W. T. Denison, K.C.B., &c., &c.; Vice-Presidents—The Hon. E. Deas Thomson, C.B., The Rev. W. B. Clarke; Honorary Treasurer—Chris. Rolleston, Esq.; Honorary Secretaries—Professor Smith, M.D., Captain Ward, R.E.; Ordinary Members of Council—Rev. Henry J. Hose, Professor

Pell, Alfred Roberts, Esq., Rev. Wm. Scott, The Hon. R. J. Want, Esq., Professor Woolley.

His Excellency then observed that, as they had now got through the business before them that evening, he had a suggestion to make, and that was that it might be found desirable for the members of the Society to divide themselves into separate committees for the purpose of jointly carrying on investigations in particular branches of science. For instance, some might be disposed to form themselves into a microscopic committee, and so to prosecute their scientific researches in that direction, wherein, as in other matters, greater progress could be made by united efforts than by working in a desultory manner. He would suggest that, in the event of such committees being formed, it should be left to them to frame their own rules, and that once a month the papers, making note of their respective operations, should be published and read. He would leave it to some member present to put this proposition in a substantive form before them, feeling assured that such a course as he proposed would, if adopted, not only be of service to the Society, but also to the community at large. He was himself at present occupied in microscopical observations with a view to an investigation into the dental system of the molusca. He did not doubt but that by adopting the course indicated, results might be eventually arrived at which would prove both curious and interesting, and perhaps even of value to the public.

Attention was called to a curious combustible material found in Van Dieman's Land, and recently sent to England for chemical analysis. This substance, which had somewhat the appearance of a slaty marl, was stated to be composed of sand and clay, intermixed with a transparent resinous matter, which caused it to ignite and burn freely when placed in contact with the flame of a candle. It emitted a disagreeable odour, when a portion of it had been burnt. The specimen produced was understood to have been recently forwarded to this colony from Launceston; and was described by Captain Ward and others to be, in some respects, analogous to "cannel coal." The analysis referred to was conducted by Professor Penny, of the Andersonian University of Glasgow, and although the final result had proved a dissappointment, the facts eliminated were extremely interesting. This analysis will be found in another page. The Rev. W. B. Clarke, in the course of conversation respecting this matter, remarked that the substance in question was not a very uncommon one, and that it was one which was to be found in some of the colder regions of Europe. Mr. Want stated that this substance was to be met with in this colony, and that he had seen plenty of it at Hartley.

A piece of this *clay-coal* was lying on the table during the conversation, and was inspected by some gentlemen present. Beside it, was also laid the chemical examination by Professor Penny above adverted to, and a memorandum written upon the subject by Captain Ward. A volume containing meteorological tables was also placed before the president, recently received from the Royal Society of Tasmania.

Professor Pell gave a popular explanation of the gyroscope, which he described as simply a philosophical instrument exemplifying certain principles affecting the motion of the earth on its axis, and in what is usually termed the "precession of the equinoxes." The instrument consisted of a metallic wheel, or *disk*, so constructed and situated in two outer circles of metal as, when once in motion, to be capable of being made to continue in revolution round any axis whatever. When the inner wheel was in rapid revolution, it could be made to support a considerable weight, and otherwise to cause results which appeared to an unscientific eye opposed to the ordinary laws of gravitation.

A microscopical committee was then appointed (on the motion of Mr. Want, seconded by Sir Charles Nicholson,) consisting of the following gentlemen, with power to add to their number:—

Rev. W. B. Clarke,	Alfred Roberts, Esq.
George Falkner, Esq.,	Professor Smith, M.D.
F. Haes, Esq.,	Captain Ward, R.E.
Professor Pell,	Dr. Williams.

The following objects of interest were laid out for the inspection of members:—

Contributed by Sir Charles Nicholson, Bart.,

Photographic Views from Rome, Florence, Constantinople, Paris, &c. Plates of Egyptian hieroglyphics. Also a box made of Aluminum.

Rev. William Scott—An Evaporation Gauge, designed by that gentleman, and constructed by Mr. A. Torning.

Professor Pell—The second years produce of a single grain of the Imphee, in illustration of its prolific growth.

The Hon. R. J. Want, Esq.—Two mosaics, one from Rome and one from Florence. Plates of utensils found in Pompeii.

Saul Samuel, Esq.—Specimens of Copper ore, from the Conoblas Mine.

F. Haes, Esq.—A specimen of crystallized gold; and several articles manufactured from Aluminum.

Messrs. Brush and Macdonnell.—A Gyroscope. A copy of the Mechanics Magazine, with particulars of experiments on the Gyroscope. An elegantly fitted Electro-Magnetic Machine. Patent Stereoscope, shewing 25 views in succession. A Folding Stereoscope. Model of the Human Eye with convex and concave lenses. A working model of a high pressure Steam Engine.

Messrs. Flavelle, Brothers and Co.—An improved Circumferenter—An improved Prismatic Compass for Vertical and Horizontal Angles—A Stereoscopic Camera by Negretti and Zambra—A Ross' Microscope—Breguets' Metallic Thermometer, and a Cabinet of Microscopic Objects.

COMBUSTIBLE MINERAL FROM TASMANIA.

THE sample of Combustible Mineral from Van Dieman's Land, forwarded by His Excellency the Governor-General to the Deputy Master of the Mint, for examination (April 23, 1859,) appears to be considerably richer in volatile matter than that sent to Professor Penny, but strange to say, it contains less fixed carbon. Even in this specimen, however, the quantity of volatile matter, is small, when compared with ordinary gas-producing coal.

Adopting for the sake of comparison, the same form of tabulation as Professor Penny, 100 parts gave the following results:—

Resinous matters.....	39·13
Sand and Clay.....	57·37
Pyrites.....	2·34
Water.....	1·16
	100·00

To determine its gas-producing qualities, a portion of the mineral was placed in a retort and maintained at a bright red heat, when a gas, of considerable illuminating power was produced in the proportion of about 5400 cubic feet per ton, when a higher temperature was employed (as might be anticipated) a much larger quantity of gas was obtained but its illuminating powers was more feeble, and, on igniting the portion, which came over last from the retort, the light emitted, was not greater, than that produced by the combustion of pure hydrogen.

Much attention will therefore be required in regulating the temperature at which the operation is conducted should the mineral be employed for the manufacture of gas, for illuminating purposes.

The results obtained, on submitting the mineral to the usual methods followed in examining gas coal were these :—

Volatile matters	35·93
Fixed Carbon	3·20
Ash	58·92
Sulphur	·79
Water	1·16
	100·00

Royal Mint, 5th May, 1859.

Andersonian University,
Glasgow, 5th June, 1854.

Report on the Chemical Qualities and Analysis of a Chemical Substance, from Van Diemen's Land; forwarded by Mr. A. McNaughtan, Hobart Town, through Mr. R. McNaughtan, Glasgow. Sent to Sir W. Denison by Mr. McNaughtan.

This mineral consists essentially of a mixture of siliceous sand and clay, with a combustible fossil substance, resembling rosin. It also contains small quantities of water, and iron pyrites (sulphide of iron.)

100 parts gave by analysis the following results :—

Resinous matter	26·54
Sand and clay.....	69·83
Pyrites	2·16
Water	1·37
	100·0

Under the microscope the leading ingredients may be easily recognised and distinguished, the clay and sand, which are nearly colourless, form the basis and by far the greater bulk of the mineral, while the resinous matter, which is of a light amber brown colour, is disseminated through the clay basis in extremely minute particles or flakes.

The resinous matter renders the mineral highly combustible. When heated in the open fire it readily kindles and burns with a light voluminous flame, giving off much smoke. The sand and clay are left as a bulky reddish coloured ash.

When distilled in a closed vessel, or retort, at a temperature below a red heat, it yields an oil, a strong acid, and tarry matter, leaving a carbonaceous residue in the retort. The volatile products are of course derived exclusively from the "resinous ingredient." The quantity of mineral received for examination was too small to admit of an extended investigation being made into the exact nature of the liquid products afforded by distillation. Even if there had been sufficient for the purpose, I should not have considered it necessary to incur the expense of procuring this part of the inquiry; for, although exceedingly interesting in a scientific point of view, it appears to me to be altogether irrelevant to the principal questions submitted for my consideration, on whether this mineral can be employed in the manufacture of gas, or be applied to steam purposes, or to any other practical use in the arts.

I have tried its gas-producing powers very carefully; when strongly and quickly heated, in the same way that coal is treated in the manufacture of gas, it affords a notable quantity of gas, which is similar in qualities and powers to that obtained from cannel coal. In consequence, however of the very large proportion of earthy matter existing in it the amount of gas that it gives is very small as compared with the quantity afforded by Scotch and English gas coal. From a careful trial, on a limited scale, I estimate that a ton of the mineral will produce about 3000 cubic feet of gas, which is a little more than quarter of the quantity yielded by good cannel coal of this country. Lesmabrago coal, which is, with the exception of Boghead coal, the most productive cannel

coal in Scotland, gives about 11,500 cubic feet of gas per ton, and the Boghead coal nearly 14,000 cubic feet.

The following table exhibits the results obtained by analysing this mineral, according to the method employed in the analysis of gas coal, and I have added for the purpose of comparison, a statement of similar results from Lesmabrago and Boghead coals.

Ingredients.	Mineral from V. D. L.	Lesmabrago Gas Coal.	Boghead Gas Coal.
Volatile Matters	20·41	55·23	67·11
Coke { Fixed Carbon	5·50	34·72	10·52
Coke { Ash	71·20	4·35	21·00
Sulphur	·73	·55	·32
Water	2·16	3·15	1·05
	100·	100·	100·

The results, in the above table, are replete with information. The actual quantity of gas that any coal may afford, may in general be fairly estimated from the proportion of volatile matters that it gives when analysed according to the foregoing method. The larger the proportion of these matters (which consist of gases and volatile liquid substances) the greater will be the quantity of gas procurable from the coal, by distillation in the usual way. On reference to the table it will be at once seen that the amounts of these ingredients (volatile matters) in the Van Diemen's Land mineral is comparatively small, and accordingly, as a gas-yielding material, it is very inferior to ordinary cannel coal.

The coke from it is utterly useless, and consists almost entirely of clay and sand, and a very small quantity of combustible matter, or "fixed carbon." The following table shews the per centage amount of coke afforded by this mineral, and by the coals previously referred to, and also the proportion of fixed carbon and ash in each coke:

	Coke from Contract fm Coal.	Fixed Carbon in Coke.	Ash in Coke.
	℔ Cent.	℔ Cent.	℔ Cent.
Van Diemen's L. Mineral	76·70	7·17	92·83
Lesmabrago Gas Coal ...	41·07	89·50	10·50
Boghead Gas Coal.....	31·52	33·38	66·62

In estimating the value of coals for the manufacture of gas the quality of the coke which is used as fuel in the distillation of the coal, and also sold for other purposes, is an important item of consideration. The heat-producing powers of coke, when used as fuel, depend exclusively on the fixed carbon or charcoal it contains, and accordingly its economic value is directly proportional to the amount of this ingredient. In the coke from Lesmabrago coal there is a large per centage of fixed carbon, and it is therefore very valuable as Fuel. Boghead coke, on the contrary, is very deficient in this respect, and almost valueless. The product from the present mineral is little else, as already mentioned, than clay and sand (nearly 93 per cent.) and scarcely entitled therefore to the name of coke.

I made a careful analysis of the ash which this mineral gives when completely burned, with a view to ascertain whether it could be applied to any useful purpose. The following statement gives the results obtained from 100 parts :—

Sand and Silecia.....	85·50
Alumina.....	10·71
Oxide of Iron.....	1·29
Lime, Magnesia, &c. ...	2·50
	100·00

From these results it is evident that this ash consists of little else than sand, and is obviously of no value whatever.

With regard to the nature of the combustible matter in this mineral, I may mention that it is essentially different from coal in its chemical composition as well as in some of its leading qualities, it is more analagous to resinous matter than any other known substance, though I must add that in many particulars it presents some striking peculiarities. Generally speaking, resins are more or less soluble in alcohol, ether, naptha, and oil of turpentine; but this mineral is very little acted upon by these solvents. It gives a small quantity of soluble matter to ether and oil of turpentine; it also partially dissolves in potash.

It cannot be considered as a bitumen as all true bitumens dissolve, to a greater or less extent in naptha and oil of turpentine, which, even after protracted boiling, have very little action on the present substance. I find also that the combustible portion of

this mineral contains a large amount of oxygen, whereas in ordinary bitumens there is comparatively a very small proportion of this elementary substance.

The following statement contains the result of an elementary analysis of the combustible matter of the mineral, and also that of coal and of resin.

	Minerals.	Resin.	Coal, Lesmahagow.	Coal, Boghead.
Carbon	61·62	72· 0	80·45	81·16
Hydrogen	9·78	9· 3	6·89	11·25
Oxygen and Nitrogen...	28·60	18· 7	12·66	7·59
	100·	100·	100·	100·

In conclusion, therefore, I have merely to repeat, that this mineral consists of clay and sand, highly impregnated with a combustible substance, analagous to resin, on the presence of which all its peculiar as well as useful properties entirely depend. The principal use to which it is capable of being applied is in the manufacture of gas for illumination. It is however very inferior in this respect to gas coal, both as regards the quantity and the quality of the gas it will give. Unless indeed it can be provided very *cheaply* and abundantly, I am clearly of opinion that it can scarcely be worked with advantage even for this purpose. In its natural state it cannot be used as fuel in consequence of the considerable amount of clay it contains, and hence it is not available for steam purposes. Its coke also, for the same reason, is perfectly worthless. The gas from it will require to be carefully and extensively purified, in order to remove the injurious products afforded by the sulphur existing in it, and the large amount of oxygen it contains, will have the effect of making the gas very thin, or, in other words, of diminishing its illuminating powers. The only other application of it, I can suggest, is for the manufacture of oil, similar to the oil obtained from rosin and coal, called rosin oil, and paraffin. These oils, now extensively employed in this country in preparing grease for machinery and for railway carriages, are made by cautiously distilling rosin and coal at a heat below that at which they yield gas. I am not prepared to state whether it could be economically applied to this purpose, as it would be necessary to make an experiment on a large scale before a trustworthy opinion could be formed. It is, however, in my opinion, well worth the trial, in the country where this mineral is found.

I would also recommend a diligent search for richer specimens of this mineral, and perhaps the resinous substance could be found in a state of greater purity.

(Signed)
FREDERICK PENNY,
Professor of Chemistry.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

TWENTY-SEVENTH MONTHLY MEETING.

Held in the Hall of the Chamber of Commerce, Sydney Exchange, Tuesday, April 5, 1859.

Members of Council present:—His Excellency the Governor-General, Messrs. Graham, Dyer, Burnell, McDonell, Driver, and W. Deane, Honorary Secretary. His Excellency the Governor-General in the chair.

Minutes of last meeting read and confirmed.

PAPERS READ.

The President read a paper giving an account of an experiment in the stall feeding of an Ox.

Mr. Burnell said, in reference to the feeding of stock, that on one of his runs where clover was abundant, that three months had been found sufficient to fatten cattle for market.

The President remarked that before long the colonists on this side of the Blue Mountains would have to look to stall feeding as the means of fattening stock for home consumption.

Mr. R. J. Want read a paper on the Cultivation of Rape or Colza Seed as practised in Normandy, which he prefaced by observing that during his late visit to France he was surprised at seeing the great quantity of Colza seed, of which the oil so largely used in commerce is made, was grown by the small farmers of Normandy, many of whom are made comparatively rich by its production, and the climate of this colony appearing to be suitable to the cultivation of the seed in-

duced him to make enquiries respecting it.

Mr. Want stated, in answer to a question from a member, that there was a difference between the regular Rape and the seed in question, and that the labour required for its growth is usually supplied by women and children. Having brought a small quantity of the seed to the colony he would feel much pleasure in placing it in the hands of the Society for distribution.

The President thought with reference to the mode of extracting the oil from the seed that it would require stamping.

Mr. Want stated that the oil could be easily expressed by the ordinary press.

Mr. Burnell said, that in his opinion the rape plant would be a good article for stall feeding.

The Secretary read two papers from Mr. Melvoorn,—How to enrich the Grape and Harrowing the Ground.

SORGHUM SACCHARATUM.

Mr. Want spoke of the fattening capabilities of the Sorghum and of the large crop which it yields, stating, in proof of which, that he knew of one acre producing £80 worth.

Mr. Graham observed that he had seen Sorghum cut four times, and four cows kept on one acre of sandy ground, and that he considered next to the Sorghum the Prairie Grass would be found one of the most valuable introductions that had been made to the colony of fodder plants.

SCALE ON ORANGE TREES.

Mr. Want stated that he had found a ley made from the orange wood efficacious in removing the black scale from orange trees, and that he considered this colony to be one of the best orange growing countries in the world.

The President remarked that he thought Norfolk Island would be a splendid Orangery for New Zealand, and that in his opinion the ground intended for orange and other fruit trees would be greatly improved by trenching instead of the system often adopted in this colony of planting in holes; indeed trenching would prove of great value in all warm climates.

On the motion of Mr. Dyer, seconded by Mr. Graham, a vote of thanks was accorded to the writers of the several papers that had been read during the evening, which, on being put from the chair, was carried by acclamation.

The next meeting of the Society will be held on Tuesday, May 3.

ON THE CULTIVATION OF RAPE OR COLZA FOR SEED, AS PRACTISED IN NORMANDY.

BEING A PAPER READ BEFORE THE HORTICULTURAL SOCIETY BY THE HON. R. J. WANT.

The seed is sown broad-cast, in the month of July, upon well manured ground, and if possible during wet weather. This is the seed bed for the future plant. It should be sown as turnip seed or cabbage seed is sown, when it is intended to transplant the young plants. In the months of September, October, and November the plants are taken from the seed bed, and transplanted for the future crop. The field is richly manured with farm-yard dung, spread broad-cast on the land, and ploughed in. The previous crop is usually wheat. The plant is then planted out in rows about two feet distant from each other, and each plant, eighteen inches apart.. In good soil, as for instance, land partly broken up from old pasture, or from wood, the crop will be much heavier and ripen more equally if planted at a greater distance. It is usually planted in every alternate furrow, but the manure plough is expressly constructed for breadth of furrow. The plant is exceedingly robust and soon recovers itself after transplanting. It thus remains permanently planted out until the month of February, when the horse hoe is set to work to pulverise the soil after the frosts. Good careful farmers then add some artificial manure to encourage the growth of the plant. The artificial manure usually employed is guano or the rape dust, and rape cake which proceeds from the manufacture of the oil. Rape cake, indeed, is one of the very best stimulants which the plant can receive.

After this spring manuring the double-mould board plough passes between the drills so as to throw the earth well up to the stalks of the plants. Nothing more is done till harvest, which occurs towards the middle of July. The chief enemy of the rape seed crop is the hail, and also the heavy rains of July are often prejudicial. As soon as the straw and seed pod become yellow, the crop is ready to cut. This is done by the sickle, and the reapers place the crop as it is cut, across the ridges, so

as to leave the air to circulate as much as possible.

In from six to ten days the grain is ready for the flail. It is a seed which sheds itself with great ease, and must be handled tenderly or much will be lost. The crop is thrashed in the field. A large space is cleared and a sail-cloth spread on the ground. A slight species of hand-barrow, or cradle is constructed, and lined with canvass. It is carried by two persons across the field and they gather up the sheaves, which, as lightly as possible, they deposit in the cradle or handcrib. When they arrive at the threshing place, they simply overturn the cradle and leave the sheaves on the floor. The least possible strike of the flail suffices to dislodge the grain. After threshing, the grain requires to be constantly turned in the store, or it will speedily heat and consume the strength of the oil.

The produce of *an excellent crop* is half a French bushel or 25 French quarts (*litres*) to every perch of 24 feet square. The present value of the grain is 14 francs the French bushel. In round numbers the yield of the crop may be estimated at 25 bushels to the acre—and I believe it often exceeds this. The profit is so very considerable that for some years past it is estimated that the Norman farmers pay rent and expenses from the rape seed crop alone. The land rent may be averaged at 1 franc the perch, or 70 francs the acre, which includes all taxes and rates.

There is another method which I would strongly recommend and that is, to sow as the Scotch farmers sow turnips. Sow in drills (manure in the drill), apply guano or bone dust, or rape dust in spring and in damp weather. Do not transplant at all, but thin out, and cultivate as for Swede turnip seed. I believe the crop would be as heavy and the expense diminished one-half, especially where labour is dear or scarce.

The after management of the colza seed is not difficult, but requires attention.

The seed when fresh harvested is apt to sweat and heat. For this reason careful farmers who wish to preserve the colour and strength of the sample, generally stow the seed away with a sufficient quantity of the seed-pod or husk. These substances mixed through the heap prevent its taking heat. The bulk must, nevertheless, be repeatedly turned over, and the granary kept aired. The yield of oil, which is the ultimate and real test of the value of the crop, varies exceedingly. This variation is not so much to be attributed to the variety of grain as to the nature of the soil, the geniality of the season, and the care bestowed on the culture of the plant. If the plant be cultivated too often upon the same soil, without adequate change of rotation, it will, as is often the case with clover, degenerate rapidly, and produce an inadequate return. The present season is considered an unfavourable one as regards production of oil, or at least it is below the average. The crop was not, however, an inferior one as regarded its appearance in the field. A crop which stands well and thick on the land will not always turn out to be the best *oil-bearing crop*.

I have tried the estimate in various houses to-day, and the average is this, that t requires 4 hectolitres, or 400 French iquarts of grain to give 200 lbs. of oil in the rough. The process of rectifying the oil, facilities for purchase of steam fuel, of water power, and the chemical processes connected with rectification are all elements of the expenditure. It is generally believed that the English market can be more readily and cheaply supplied by purchasing the grain in France, crushing and rectifying in England, than by purchasing the article, ready made for use, in France. French colza oil is constantly sold cheaper by retail in London, than its wholesale value is quoted in the Caen or Rouen colza markets.

It has been repeatedly asserted that English oil-crushers have purchased "rape cake" in France in order to re-crush it in superior machines, and then dispose of the oil cake. I have heard it said, that ten per cent. on the value has been gained by this species of speculation. This is now probably at an end. First, because the French crushing mills are vastly improved in economy and power; and secondly, because the value of the rape cake is so greatly increased, in consequence of the demand for it as a manure for the colza crop.

It appears to me that for the fresh "virgin" soils of the colonies, where the climate is suitable and labour is to be had that the rape or colza cultivation will be a most valuable element of commerce as well as of farming.

RESULT OT STALL FEEDING IN TASMANIA.

Quamby, 7th January, 1859.

I have much pleasure in sending the particulars of the feeding of Sir Richard Dry's fat Ox, exhibited at Longford, at the Northern Agricultural Society's Show, on the 4th November last. It is but fair to state, that with one exception only, I had not another ox that would have attained the same degree of fatness in so short a time, and with the same amount of food. I had always remarked "Sam's" disposition to lay on fat, which I attribute in great measure to his breed, he being a half-bred Durham and Devon, of almost pure blood on both sides.

I am convinced that cattle bred from pure Durham cows, by pure Devon bulls, are the most profitable to the grazier, and come earlier to market than cattle of any other cross or breed, and while they attain the full weight of the Durham, also acquire much of the hardihood of the Devon. Devon cows put to Durham bulls will fail to produce similar stock, size always being indispensible not only in the cow but also in her breed.

"Sam" was taken up from grass in fair feeding condition, on 21st May last, and put into a loose box, his market value being about £15; being uneasy in his quarters he did not begin to "feed" till about 1st June, from which date till 1st November he consumed the following quantities of food, the respective kinds being valued at the rates at which they were at the time saleable at the barn door:—

	£	s.	d.
Wheaten Hay Chaff, 1920 lbs., at 5s. ℔ cwt.	4	5	10
Refuse Barley, boiled, 9½ bushels, at 3s. ℔ bushel..	1	8	6
Ditto Wheat, ditto, 23¼ ditto, at 3s. 6d. ℔ bushel	4	2	3
Good feed Oats, crushed, 12¼ bushels, 6s. ℔ bushel	3	16	6
Inferior Swede Turnips, ½ ton, at 40s. ℔ ton	1	0	0
Green Cape Barley, in very small quantities, during October, about 1 cwt. altogether	0	5	0
Total value of food ..	£14	18	1

"Sam" took the first prize at the Northern Agricultural Society's Exhibition, of Stock, on 4th November last, and was immediately after sold for

		£	s.	d.
		£60	0	0
Original value	£15 0 0			
Cost of food	14 18 1			
	£29 18 1			
		29	18	1
Net profit, besides manure ..		£30	1	11

The price at which Sam was sold was quite beyond his intrinsic value, beef being at the time worth 50s. per 100 lbs. When killed he weighed 1460 lbs., having probably lost about 40 lbs. by being turned out to grass for some time previous being killed.

	£	s.	d.
At 1460 lbs., at 50s. per 100 lbs. ..	36	10	0
Cost as before	29	18	1
Net profit	£6	11	11

Exclusive of manure; having provided a market for £14 18s. 1d. worth of farm produce at the door.

(Signed) EDWIN MEREDITH.

HOW TO ENRICH THE GRAPE.

The most extraordinary difference in the richness and flavour of grapes that have been enclosed in bags on the vine when green, over the grapes that are left exposed, will hardly be credited. Grapes enclosed in cotton bags not only ripen sooner, but are enhanced in real value 50 per cent. Too much attention cannot be paid to having a large supply of bags systematically on hand. They should be made in accordance with the formation of the cluster, with a small hole at the extremity to allow rain water to escape. The same bags would last many years, as they would only be exposed to the air and weather for about a month each year. Bagging for grapes, if ever the system was generally adopted, would be made by factories in England, and sold by thousands in these colonies. I implore vineyard proprietors to bag their grapes. The vine would be doubly improved by doing so.

HARROWING THE GROUND.

In this colony where weeds strive with all their might to supplant hand sown crops, uniformity of depth of soil should be most carefully studied. With regard to the sowing of grain, I observe that farmers throw in the seed immediately after ploughing. This is an awful mis-

take in this climate, and if they can only be induced to harrow the ground before scattering the seed they will ever afterwards follow the plan. No grain will come up at once and have possession of the field before the weeds, which the deep furrows of the plough enabled to spring before the deep-sown grain had shot up, as we all know what tyrants weeds are if they once get a footing or a start of almost any crop, but especially of wheat crops.

THE CULTIVATION OF THE OLIVE.

By David Shepherd.

The subject for my paper is the cultivation of the olive in this colony, but before entering particularly upon that subject I think it would be interesting to you (without occupying too much time) to give a brief description and history of the olive tree itself.

The olive, botanically *olea sativa* or *olea Europea*, is a low branching evergreen tree, from twenty to thirty feet in height, with stiff, narrow dark-green, or blueish leaves; the flowers are produced in small auxillary bunches, from wood of the former year's growth. The fruit is a berried drupe, of an oblong spheroidal form, the fleshy part hard and thick, at first of a yellowish-green colour, but becoming black when ripe. The matured wood is hard and compact although rather brittle, and has the pith nearly obliterated as is the case with box. Its colour is reddish, and it takes a fine gloss or polish; on which account the ancients carved it into statues of the gods; the moderns make it into snuff-boxes and other trinkets. The olive differs from most trees in yielding a fixed oil from the pericarp instead of the seed.

The olive is supposed to have been originally a native of Asia, and grows abundantly about Aleppo and Lebanon, but it is now naturalized in Greece, Italy, Spain, and the South of France, where it has been extensively cultivated for an unknown length of time, for the oil expressed from its fruit.

The wild olive is found indigenous in Syria, Greece, and Africa, on the lower slopes of the Atlas. The cultivated one grows spontaneously in Syria, and is easily reared on the shores of the Levant. Tuscany, the South of France, and the plains of Spain are the places of Europe in which the olive was first cultivated. The Tuscans were the first who exported olive oil largely, and thus it has obtained the name of Florence Oil: but the purest is said to be obtained from Aix in France. The tree attains an incredible age, near Farni, in the vale of the cascade of Marmora is a plantation above two miles in extent, of very old trees, and supposed to be the same trees mentioned by Pliny as growing there in the first century of the Christian Era.

In ancient times especially the olive was a tree held in the greatest veneration, for then the oil was employed in pouring out libations to the gods; while the branches formed the wreaths of the victors at the Olympic games. Some of the traditions say that it was brought from Egypt to Athens by Cecrops; while others affirm that Hercules introduced it to Greece on his return from his expeditions; that he planted it upon Mount Olympus, and set the first example of its use in the games. The Greeks had a pretty and instructive fable in their mythology, on the origin of the olive. They said that Neptune having a dispute with Minerva as to the name of the city of Athens, it was decided by the gods that the deity who gave the best present to mankind should have the privilege in dispute. Neptune struck the shore, out of which sprang a horse; but Minerva produced an olive tree. The goddess had the triumph; for it was adjudged that peace, of which the olive is the symbol, was infinitely better than war, to which the horse was considered as belonging and typifying. Even in the sacred history the olive is frequently mentioned, and invested with more honour than any other tree.

The patriarch Noah had sent out a dove from the ark but she returned without any token of hope. Then "he stayed yet other seven days, and again he sent forth the dove out of the ark: and the dove came back to him in the evening, and lo, in her mouth was an olive branch plucked off: so Noah knew the waters were abated from the earth."

In Gibbons Decline and Fall, he quotes Pliny for the following facts—the olive in the Western world followed the progress of peace, of which it was considered the symbol. Two centuries after the formation of Rome, both Italy and Africa were stran-

gers to that useful plant; it was naturalized in those countries, and at length carried into the heart of Spain and Gaul. Its usefulness, the little culture it requires, and the otherwise barren situations which it renders productive, quickly spread it over the western face of the Appenines.

According to Humboldt, the olive is cultivated with success in every part of the old world, where the mean temperature of the year is between 58 deg. and 66 deg.; the temperature of the coldest month not being under 42 deg., nor that of summer below 71 deg. These conditions are found in Spain, Portugal, the South of France, Italy, Turkey, and Greece. The olive also flourishes on the North Coast of Africa, but is not found south of the Great Desert. In Europe it extends as far north as latitude 44½ deg., in America scarcely to latitude 34 deg.—so much greater is the severity of the winter on that side of the Atlantic. In the neighbourhood of Quito, situated under the Equator, at a height of eight thousand feet above the level of the sea, where the temperature varies even less than in the island climates of the temperate zone, the olive attains the magnitude of the oak, yet never produces fruit.

Olive oil may be said to form the cream and butter of those countries in which it is ground; the tree has been celebrated in all ages as the bounteous gift of Heaven, and the emblem of peace and plenty. Some authors have styled it a mine upon earth.

In Italy the young olive tree bears fruit at two years old, that is in two years after it has been placed in the plantations: in six years it begins to repay the expense of cultivation, if the ground is not otherwise cropped. After that period the produce is the surest source of wealth to the farmer. The age at which an olive tree ceases to be productive is not clearly ascertained. The plantation I have already mentioned as still existing, near Farni, in Italy, must have attained the almost fabulous age of two thousand years, and is still in a state of productiveness. "There is" says a traveller "an old olive tree, near Gerecomio, which last year yielded 240 English quarts of oil; yet its trunk is quite hollow, and its empty shell seems to have barely enough hold in the ground to secure it against mountain storms." There is a common saying in Italy, "that if you want to leave a lasting inheritance to your children's children plant an olive."

Like most other trees that have been cultivated for a length of time the olive has produced numerous varieties; different countries or even different districts cultivating their peculiar favourite. The variety *longifolia*, and its many sub-varieties, are chiefly cultivated in France and Italy. The variety *latifolia*, and its sub-varieties, are those chiefly cultivated in Spain. The fruit of the variety *latifolia* is nearly twice the size of the common olive of Provence and Italy but the oil is greatly inferior.

Now if we compare the temperature of our climate with that which according to Humboldt (and which I have already noticed), is adapted to the cultivation of the olive, we shall at once perceive that we possess every advantage as far as climate is concerned. Humboldt says, that the olive is cultivated with success, where the mean temperature of the year is between 58 deg. and 66 deg.; the temperature of the coldest month not being under 40 deg., nor that of the summer below 71 deg. The mean temperature of the year at Sydney is 65 deg.; the mean of summer, 74 deg.; of winter, 55 deg.; and of the hottest and coldest months respectively, 75 deg. and 54 deg. This comparison shows that our mean yearly temperature is precisely that required; the mean temperature of our coldest month is 54 deg., or 12 deg. above the lowest in which the olive will thrive, and that of our summer 74 deg., or 3 deg. above that required. Thus we find combined in our climate all those conditions of temperature necessary to the cultivation of the olive, which there can be no doubt were deduced from actual observation. But besides this, we have a more practical proof in the fact that the production of small quantities of oil and pickled olives, of a very superior quality, has already been accomplished.* Now, although this may be considered as only an experiment

* A sample of colonial olive oil, grown and manufactured by Mr. Shepherd, was exhibited at the meeting. It possessed all the qualities of the finest olive oil of commerce. It was stated at the close of the reading that a sample of the same oil had been forwarded to the Paris Exhibition, and that the Judges had declared it equal to any of the olive oils grown on the shores of the Mediterranean.

(To be Continued.)

AN ACCOUNT OF THE LLAMA AND ALPACA WITH NOTES OF A JOURNEY FROM THE BOLIVIAN AND ARGENTINE PROVINCES INTO CHILI WITH A FLOCK OF THESE ANIMALS,

By Charles Ledger, Esq.

(Continued from our last.)

The night of 11th September, a stone intended no doubt for my head, dreadfully bruised my right ancle. I was sleeping at the time under a small awning tent, open at both ends, with a couple of hide trunks one on top of the other at the ends, (the hut I used as a store only) and every now and then I used to change the pillow from head to foot, and that night after being in bed I had done so. I spoke not, but sat up in the bed with revolver in hand, and I could see through the light stuff the awning was made of, and distinctly perceived two shadows swiftly retreating. I kept on the alert until day-break, then crawled out, and found that the six men had decamped taking with them six donkeys, three mules, our pots, pans, and every little thing of value that was not in the store-hut.

On 15th, Pedro, Pablo, and nine men that went to bring the hay returned and found me in bed, and the animals in charge of the two lads. Pedro had made an excellent sale of the coca, I had gained 200 per cent.; he had realised nearly £400 or 2000 dollars for me; had secured 16 ton of hay at a very low figure, contracted carriers for all he could not bring up on our animals, and had accomplished more than I ever expected he would have been able to do.

Dionicio and Manuel returned from Pulmamarca where I had sent them for flour, wheat, and maize, they brought four mule loads of 250 lbs. each, the regular load is 300 lbs. net. On 17th, the second attempt to carry off our animals met with the same result; no men were killed, however, two of mine were slightly wounded, with slugs I hobbled out of bed, but was too far off to see anything, as they were then in the gully, not many shots were fired; Pedro brought back one of our mules and also one of the Indians that had decamped on the night of 11th. From this man we learnt that the Correjidor of Rosario, Calisto Esquivel, headed the party, that Vasquez being ill had refused to accompany him; he also declared, that Esquivel had sent Indians offering them all the Alpacas, Llamas, Mules, &c., if they would bring them off; he said they had refused at first (and I really believe so, if they had not awaited a 2nd and 3rd emmissary they would have tried to put me out of the way before, and they knew that I hourly expected Pedro, Pablo, and the other men back) that Esquivel had again sent to say that if they did not obey him, on their return to Bolivia they would be made soldiers of; he afterwards sent word that their families would be put in prison, and their miserable flocks of Sheep and Llamas confiscated. He further said that the two who remain behind (Josè Ma., and Maro. Flores) to throw the bit of rock at my head, were aware that it had not taken effect as they desired, and fearing the pistol that they knew I always carried about with me, and which they also knew could kill 6 men, had precipitately run away and joined the others, then some way off with the mules and things robbed. They then hurried on to Rosario, arrived there the next night and two of them accompanied the Correjidor (who only brought fifteen Indians) as guides to our encampment. The next day I sent this poor wretch off, as I was owing the whole of them nearly £8 or 40 dollars each, I paid him, and told him that if the others, excepting of course Josè Ma. and Mo. Flores, brought back the property they had stolen, I would pay them too. He then told me that Esquivel had taken the mules and donkeys away from them. By this man (Josè Choque) I wrote to Esquivel. As Pablo was not known, I determined on sending him into Bolivia, with orders to buy coca and see what had become of Pedro's flock, he started on the 25th of September, 1855.

Leaving Pedro in charge of flocks, I also went to the Valles Calchaquis with the intention of looking out for lucerne paddocks to place the flocks in, as I could not afford to be carrying such a distance the hay, which by all means I had to accustom the animals to, that being the only class of provender that I could count on for the animals during the voyage to Australia, moreover it was necessary that I should collect together in one spot, my mules and horses disseminated then in so many places. Arriving at La Poma, stopping two days, passing down the valley ten leagues arrived at Payogasta, two leagues further Cachi, and from there to Molinos twelve leagues, both sides of the valley are under irrigation some three miles, there not being water enough for more cultivation. It was on this trip, that I commenced acquaintance with the hospitable and generous proprietors of the large estates in these valleys and I shortly obtained the friendship of all, retained it for more than two years, and sincerely hope that I may do so during life, I attribute the preservation of the animals to the unlimited confidence with which I was enabled to inspire them, to their unbounded generosity and sympathy in my undertaking, so replete with natural and unforeseen obstacles, more than to anything else.

I can never forget
Corbalan and Lozano, in La Poma.
Col. Ruiz and Aranda, in Payogasta.
Col. Aramburu, Bustamante, Frias, and Cura Marino, in Cachi.
Rioja, Solaligue, Hargurren, in Seclantas.
Gorostiaga, Pierola, in Molinos.

Proud at all times of being an Englishman, it is indeed a glorious title the being one in those parts, and wretch indeed would be the one that ever allowed, by improper conduct, that high name to be lowered. These valleys produce almost all the wheat consumed in the Province of Salta, export it to Tucuman, Injury, and the Bolivian Province of Atacma, breed animals and supply some 12,000 pack mules for the transport of manufactured goods from the Port of Cobija to Potosi, Tarija, Salta, and Tucuman; the inhabitants are very industrious and remarkable for natural honesty, hospitality, and politeness.

Having secured the paddocks that I considered necessary, sent parties to bring the mules from the different places where I had been compelled to leave them, I again returned to the flocks. Found that thirteen had died, and that there were several in very bad condition, which I afterwards lost, that refused to eat the lucerne hay, there was very little pasture at that season of the year. Seeing the animals dying where they were, I determined on making efforts to gain the "valles," distance some forty leagues, that day commenced moving. The task of getting the attenuated animals along was one of the severest of the whole expedition, the forty leagues or hundred and twenty miles took us forty-seven days to accomplish; there were not twenty animals in the two flocks that could get up without assistance. What with carrying some on donkeys, others on our shoulders, we managed to get along, not a blade of grass to be met with, or a single

drop of water in the dried up water courses. I must confess, that then, despondency for the first time assailed me and I seriously thought of abandoning the enterprise, or rather say the enterprise seemed to have abandoned us. Our donkeys and mules being overworked bringing water from a distance, and having but little to eat were dying daily, the men also done up, yet not a murmur did I hear, the immense number of condors that followed our track gave evidence of our losses in Alpacas. At last, with a loss of 103 including the 13 noted previously, I got the remaining 306 into a paddock of half-consumed lucerne, on the 28th November of that year. It was during that arduous journey that I had sufficient motives for appreciating the immense endurance of the Llama as a beast of burden, our Llama carriers, the whole 47 days were loaded with the hay that we were obliged to carry with us, part of our baggage and provisions and for six days together worked without tasting water.

After arriving at "La Poma" I fancied that our losses would cease. Vain hope! 53 Alpacas died within 15 days, absolutely refusing to eat a mouthful of lucerne.

In first days of December, Pablo Soza returned with 60 sestos coca, he brought them on Llamas that he had bought, and our carriers were augmented by 20.

The flock of Alpacas taken from Pedro he had seen, they had not been driven back, as they were too lean at that time to attempt any such thing, he assured me that they were fast picking up, and he had been told by the Correjidor, Cuisa, that in February, or after Carnival, they were to be sent to Lipes and to be there divided among the captors, by the Governor, Don Diego Povil, of the Province. He explained the want of vigilance that was shewn in their care, their pasturing in a fine grassy swamp not 7 leagues from the frontier, and that the general idea existed of my having lost the other flocks in the transit, and that I had retired to Coppo. He had so ingratiated himself in the good graces of the Correjidor Cuisa, and writing a pretty good hand, had served as amanuensis, written his official notes, brought me copies of all in connection with the seizure of my animals, and thereby put me in possession of valuable information.

1856. On 1st February, many of the mules being in first-rate condition, and without making my intentions known, I ordered 8 mules and 2 horses to be shod (this we always did ourselves) and preparations made for a journey. On 3rd leaving Pedro in charge of the reduced flocks, I left "La Poma" with 50 of my best men with the object of endeavouring to regain the Alpacas that had been taken away from me. I sent Soza on a-head, ordering him to take the road by Santa Catalina into Bolivia, proceed at once to San Pablo, see the Alpacas "en route," and under some pretext or the other return to meet me at "la Cieneya," where I would await his return.

I then travelled by easy stages, so as to allow Soza time, and arrived in 9 days at "la Cieneya," 2 days afterwards I received a letter from Soza, by an Indian on foot, directed to Dionicio Sansusti, one of my men, stating that he was proceeding to San Vicente with the Correjidor of San Pablo to purchase a lot of coca that he offered him for sale, telling Sansusti not to delay in arriving with the mules, as the moment was propitious for making a good speculation. I readily understood that all was right, that I was to hurry in, whilst he took the Correjidor away in contrary direction. The messenger told me he had another letter from Soza to carry on to "Queta," and that he had been paid to do so; I understood by this that the Indian was not to be trusted, and that I must not take him back with me, I therefore gave him a little coca, flour, and meat, and told him to proceed without delay on his mission. That evening we saddled, travelled all night, and early the next morning arrived where the Alpacas were, finding them in the yards; a poor old woman and her two sons had charge of them; I told her that I had come to take them away, that they were my property and that I intended no harm to her—of course she or her two sons could offer no resistance, and we immediately drove them out of the yards and commenced our journey back, across the frontier; she importuned me for a receipt, so as to shew to the Correjidor which I gave her, or rather a certificate that I had retaken possessiou of my own property.

The next day I got the animals to "la Cienega" and on counting them found 147 full-grown and 11 young Alpacas,—the remainder of 171 taken frem Pedro, the flock having originally been 200. Being the middle of summer and a great deal of rain having fallen at intervals since December, the road was well supplied with pasture and water.

I had now succeeded at different times in getting into territory of Argentine Confederation as follows:—

1852.—312	out of 450	
1854.—160	„ 197	
472		
184	less, that died in the snow, January and April. 1854; as also 200 lambs of 1853-54	
288		
113	lambs, in 1855, February.	[do
1855.—169	out of 171	purchased from Oban-
1856.—158	„ 200	„ by Pedro
728	1018'	

(To be Continued.)

ON THE CULTURE AND PREPARATION OF COTTON IN THE UNITED STATES OF AMERICA.

By Leonard Wray, Esq.

(Extracted from the Journal of the Society of Arts, December 24, 1858.*)*

(Concluded from our last.)

I dwelt thus fully on this point because people are too much in the habit of fancying that slave labour, as it exists in the southern states, is merely that of a set of barbarians, urged on by the whip; labour which can be excelled by white men in the proportion of one of the latter to three of the former. There cannot be a greater error—a more absurd mistake.

If such negroes could be had in our co'onies, and would work as they do on the cotton plantation, I would rather have them at Englishmen's wages than any white men I ever saw; and I even doubt whether they would not be worth double the value of a white labourer.

We may, therefore, truly say that the American cotton planter has cheap labour, because it is really so well-trained and so good; so incomparably superior to mere brute strength bunglingly and wastefully applied.

I have passed a portion of my life in India, where we have another description of cheap labour, viz., full-grown and able-bodied men at six shillings a month, finding themselves in food and clothing; but how many of these coolies can we estimate as being equal to one trained negro?

—The desparity is really enormous, if we quit hand-labour, and come to horse or mule-husbandry, which every agriculturist knows, constitutes the very life and soul of plantation work. It is true that these coolies can be taught—in time, and by dint of personal exertion and perseverance of the most wearying nature, as I well know having had some thousand of them daily on whom to exercise my own patient determination, and from whom to learn the length, and breadth, and depth of a native's passive resistance to practices opposed to his own prejudices. I reiterate, therefore, this important truth, that the planter of the southern States has at his command such a body of trained labourers as we may seek for in vain elsewhere.

It behoves us, then, to bear this fact in mind, with a view to discover how we can apply our inferior labour, backed by our own energies, in competing successfully with them in the cultivation and supply of both descriptions of cotton.

Let us not shut our eyes to any of our difficulties and disadvantages, but manfully look them all in the face, and apply ourselves to the discovery of means whereby we may satisfactorily overcome them.

The description of labourers which we, as Englishmen, have to deal with, depends of course upon the locality in which we decide to carry out operations. I will therefore refer to their several merits and demerits as we glance at the suitability of the countries themselves.

Cotton Growing Localities of Britain.

I must ask attention in the first place to the particular climate and seasons demanded by the cotton plant, and to some very marked features in its character.

In the early part of their growth, if the young plants have a few slight showers of rain until they have taken good hold to the ground and become about a foot high, it is suprising how much dry weather they will afterwards stand. Last year, in South Carolina, for seven weeks there did not fall one drop of rain; then they had a few light showers, followed by another spell of dry weather; yet it was considered a good cotton season, the bushes thriving well, and producing abundantly, notwithstanding that the intense heat of the sun had baked the soil as hard as a brick.

In remarking on this peculiarity of the plant, my planter friend replied, "Yes, for cotton we require very little rain indeed, whereas for corn, the more rain we have the more abundant are our crops, so that a very favourable season for the one, is sure to be unfavourable to the other."

In a wet season also, the planter has the greatest possible difficulty in making his cotton crop, for the weeds spring up so rapidly, and will not die, although hoed up repeatedly; whereas in a dry season, a light hoeing suffices to kill them and keep the fields clean.

This endurance of excessive dry weather is something quite remarkable; but I must also mention the hardiness of the plant in respect to cold, which in autumn does not seem to hurt it, unless a really killing frost occurs.

This hardihood gives to the cotton plant a very wide climatic range, although for commercial purposes this range is materially lessened, from the circumstance that it is essentially necessary to have comparately dry weather during the whole of the picking season; or, in other words, a dry autumn is imperative.

Last year (1857), the cotton plantations on the Mississippi suffered extremely from a dripping autumn; the bolls refusing to open, rotted on the branches, and those that did open fairly presented a forlorn appearance, with the cotton hanging down in long lengths, soaked and dripping with water.

The same reason it is which operates against Algeria, and which will prevent its ever becoming a large cotton-producing country, for the autumns and winter there are generally cold and wet, while the summers are generally parched and dry to a degree.

Of the three provinces, Oran appears to be by far the most suitable, although even there the plants require irrigation during the parching heats of summer. But if we go further westward, along the same coast, we shall find at Tangiers, as I am informed, a still more favourable climate and season.

But leaving the northern coasts of Africa, and also the more deadly West Coast (at present the scene of Mr. Clegg's enterprising labours), let us at once direct our attention to a right valuable British colony, enjoying one of the finest climates in the world, with cheap land, cheap provisions, and cheap labour. This is our hitherto neglected colony of Natal, in Kafirland, on the south-east coast of Africa. A three years' residence in that country has given me a sufficient experience of its climate, seasons, and capabilities, to enable me to speak with some certainty on these points, and I give it as my conviction, that in no quarter of the world can a spot be found combining so many advantages, and so peculiarly adapted to the growth of cotton, as our colony of Natal.

1. In the first place, the climate is most salubrious, and, for six months of the year, perfectly delightful, and highly exhilarating.

2. The rains occur during the six months of summer, whilst the other six months are dry, clear, and serene.

3. Suitable lands vary in price from 2s. to 20s. per acre, and being mostly all cleared, the plough can be put into them at once, at the smallest expense and trouble.

4. English farm-servants can be hired at much the same rates that are paid in England, and they in general become much more handy than they are in this country.

5. The natives (Kafir Zulus) may be hired at from 7s. to 10s. per month, besides their simple food, which costs only from £3 to £4 each per annum.

6. Excellent working oxen can be purchased in any number at from £2 10s. to £3 each. Mules, from £16 to £20, and horses and mares, at from £8 up to £20 each.

7. Beef, 2d. to 3d.; mutton, 4d.; pork, 4d.; per lb.; fowls, 6d. each.

8. Pasture lands exist to any extent, and are of the most nutritious quality.

9. And lastly, the cotton plant is here perennial.

These facts and figures go to show the extraordinary advantages offered by Natal as a cotton-producing country, but we must not overlook the one great drawback, viz., the want of abundant and really reliable labour; for, at present, Kafir labour, though cheap, is not abundant, and cannot by any means be relied upon in so ticklish a culture as cotton.

This is indeed a very serious drawback, one that would effectually prevent any extensive cultivation of this plant, for when its bolls have opened and the cotton is ready for picking, it must be picked, or the crop will be lost. Fortunately, however, it is a drawback which admits of a remedy, and which the colonists are already taking seriously in hand, although I am afraid that unaided there means will not allow them to carry it out.

The Mauritius, which, after emancipation, was on the very brink of ruin, has not only been

resuscitated by Indian labour, but has been raised to a far higher state of prosperity than it ever enjoyed before: and lands of any kind capable of growing the sugar cane have been bought up at £50 per acre. Why should the same remedy not be applied to Natal? Why should this fine colony not be supplied with any number of coolies she may require, and thus become a great and valuable possession?

I know, along the coast line of 300 miles, abundance of land eminently suited to the growth of the finest Sea Island cotton; land that might be calculated on to yield from 200 lbs. to 500 lbs. of it, cleaned, per acre,

Immediately at the back of this line commences the region for the upland varieties; and what vast tracts are here lying idle, and, at present, next to useless; lands into which the plough may at once be put, and on which steam machinery may effectually aid the planter in all the branches of his work.

A few years ago, some German land jobbers and others, got up a Cotton Company; imported a number of raw German families; built cotton houses, and erected machinery for ginning and pressing the bales; but, as in all such crude, ill-digested attempts, this Cotton Company turned out a dead failure, principally from two causes, viz., planting their seed in September instead of November, in consequence of which the cotton became fit to pick two months before the rainy season had ceased; and, secondly, the refusal of the German labourers to continue the cultivation, and their betaking themselves to other occupations.

The failure of this attempt has thrown discredit upon Natal as a cotton producing country; whereas, with a proper supply of labour, it cannot be excelled by any country in the wide world.

The next country to which I must allude is Australia, from the Illawarra district up to the Gulf of Carpentaria on the Eastern side, and the whole of Western Australia on the opposite coast; offering an extent of cotton country so vast that one hesitates almost to speak of it, seeing that at present nothing of the kind can be attempted for want of labour. Yet one cannot help thinking of the multitudes of lovely Sea Islands there are all along the coast, from Moreton Bay up to Cape York, all more or less suitable for Sea Island cotton, and all of which could be readily supplied with labour from India.

But let us pass on to India itself, that noble country, abounding in natural advantages, and possessed of a teeming population. The cotton region of Central India is said to be three or four times that of the Southern States of America, but hitherto its capabilities have not been brought into play, on account of the difficulty of bringing the produce to market from the far interior. Railroads are now, however, opening up this important region, and we may soon expect to feel the highly beneficial results of these wise and politic measures.

I have seen a great deal of cotton cultivation in India, and could dwell upon the subject at very considerable length; but I refrain from doing so, as I am well aware that the Society, at a subsequent meeting, will have a valuable paper on this subject, read by a scientific and highly competent gentleman.

I will therefore merely direct attention to two points, viz., the singular fact that no Europeans have ever attempted to grow cotton in India on their own account, but have contented themselves with buying the native grown cotton with all its imperfections.

Now, I am inclined to think that Europeans might make handsome fortunes by growing cotton in India; more especially, perhaps, were they to devote themselves to the finest Sea Island on the coasts, and down in the Straits of Malacca. With a suitable soil and climate, and labour at from 6s. in India to 12s. in the Straits, per month, I do not see why well organized cotton plantations should not pay well, and become general throughout the country.

The second point to which I could attract attention is, that if the United States employ upwards of seven million acres of land in the culture of cotton, and produce 3 millions of bales, we must bear in mind that India already cultivates double that quantity of cotton land, and produces almost entirely for internal consumption from four to five million bales—a fact little dreamed of in this country or elsewhere, but one which shows us how readily she could supply all the cotton we require, and much more, if the roads were opened and an energetic demand made upon her.

In carrying out the cultivation of cotton, do not let us overlook the assistance which steam machinery offers us; for it is by the aid of such machines as Romaine's, and others of a similar character, that I consider we shall be able to maintain in our colonies a successful competition with the trained labour of the southern states of America. Bear in mind that a really efficient machine of this sort would be equivalent to at least 10 slave "hands" and 10 mules; and knowing this, let us not fear such competition, formidable as it is.

In conclusion, I hope, and most earnestly trust, that our countrymen will, one and all, bestir themselves in this important matter, and never let the subject rest until we can positively assure ourselves that our great cotton manufacturing industry is placed upon a safe and unassailable basis.

CORRESPONDENCE.

To the Editor of the Sydney Magazine of Science and Art.

Sir,—Your February number contains a highly interesting paper "on the Ores of Mercury," read before the Philosophical Society by the Rev. W. B. Clarke, and which contains the following passage:—

"Having heard with my own ears, Dr. Lardner "declare at a meeting of the British Association, "*at Liverpool*, in 1837, that steamships could not "cross the Atlantic from Great Britain to Amer-"ica, because there were no coal depôts on the "way, and that within a few months of the es-"tablishment of the fact, that a steam vessel had "accomplished the voyage, I am not one of those "who would despond, because persons of a cer-"tain eminence in general science, or of expe-"rience in distant countries, are pleased to think "that their own limited observation is sufficient "to deny all hope to more bold adventures."

In common with all those who have read the Rev. W. B. Clarke's numerous contributions to geological science, I entertain the highest opinion of that gentleman's views on that subject, but in justice to Dr. Lardner, whose scientific acquirements I equally respect, I cannot allow this statement to go forth, without giving the other side a hearing, which I am fortunately in a position to do by quoting the doctor's *own words* on this subject, and which are to be found in a Treatise published in 1856, called "Steam and its uses," by Dionysius Lardner.

In the chapter on steam navigation, will be found the following passages:—

"It cannot be seriously imagined, that any one who had been conversant with the past history of

steam-navigation, could entertain the least doubt of the abstract practicability of a steam vessel making the voyage between Bristol and New York." * * * "But independently of these considerations, it was a well known fact, that long antecedent to the epoch now adverted to (1836) the Atlantic had actually been crossed by the steamers "Savannah" and "Curaçoa." Nevertheless a statement was not only widely circulated, but generally credited, that I had publicly asserted that a steam voyage across the Atlantic was "*a physical impossibility*."

"Although this erroneous statement has been again and again publicly contradicted through various organs of the press, it continues nevertheless to be repeated. I shall therefore take this opportunity once more to put on record, what I really did state on the occasion, on which I am reported to have affirmed that the Atlantic steam voyage was a physical impossibility."

"Projects had been started in the year 1836 by two different and opposing interests, one advocating the establishment of a line of steamers to ply between the west coast of Ireland and Boston, touching at Halifax, and the other a direct line, making an uninterrupted trip between Bristol and New York. In the year 1836, on the occasion of the meeting of the British Association at Dublin, I had advocated the former of these projects."

"On the occasion of the next meeting in 1837, at *Bristol*, I again urged its advantages, and by comparison, discouraged the project of a direct line between Bristol and New York. When I say that I *advocated* one of these projects, it is needless to add that the popular rumour, that I pronounced the Atlantic voyage impracticable, *is utterly destitute of foundation*. But I am enabled to offer more conclusive proofs than this, that, so far from asserting that the Atlantic voyage by steam was impossible, *I distinctly affirmed* the contrary."

"The *Times* newspaper sent a special reporter to attend the meeting at Bristol, and more particularly to transmit a report of the expected discussion on the Atlantic steam voyage, which at the moment excited much interest. The meeting took place on the 25th, and the report appeared in the *Times* of the 27th August. From that report, I extract the following:—

"Dr. Lardner said he would beg of any one, and more especially of those who had a direct interest in the enquiry, to dismiss from their minds all previously formed judgments about it, and more especially on this question, to be guarded against the conclusions of *mere theory*, for if ever there was one point in practice, of a commercial nature, which more than another, required to be founded on experience, it was this one of extending steam navigation to voyages of extraordinary length—he was aware that, since the question had arisen, it had been stated that his own opinion was adverse to it. This statement *was totally wrong*, but he did feel that great caution should be used in the adoption of the means of carrying the project into effect. Almost all depended on the first attempt, for a failure would much retard the ultimate consummation of the project."

"Mr. Scott Russell said that he had listened with great delight to the lucid and logical observations they had just heard. He would add one word. Let them try this experiment, with a view only to the enterprize itself, but on no account try any new boiler or other experiment, but have a combination of the most approved plans that had yet been adopted."

"After some observations from Messrs. Brunel and Field, Dr. Lardner in reply, said that *he considered the voyage practicable*, but he wished to point out that which would remove the *possibility of a doubt*, because if the first attempt failed, it would cast a damp upon the enterprize, and prevent a repetition of the attempt."

"Such was the report of the *Times* of the speech in which I was afterwards, and have ever since been represented as having declared a steam voyage across the Atlantic a *mechanical impossibility!* What I did affirm and maintain in 1836-7 was, that the long sea voyages by steam which were contemplated, could not at that time be maintained with that *regularity* and *certainty* which are indispensable to commercial success, *by any revenue which could be expected from traffic alone*, and that, without a government subsidy of a considerable amount, such lines of steamers, although they might be started, could not be permanently maintained."

Now this statement of Dr. Lardner's opinion, as expressed to the meeting at Bristol in 1837, was fully borne out by the result, as seven steamships, including the "Great Western," were soon after the time of these debates, placed upon the line between England and New York;—of these vessels the "Sirius" was almost immediately withdrawn: the "Royal William," after a couple of voyages, shared the same fate;—the "Great Liverpool," in a single season, involved her proprietors in a loss of £6000, and they were glad to remove her. The proprietors of the "British Queen," after sustaining a loss which is estimated at little less than £100,000 sold that ship to the Belgian government. The "United States" was soon transferred to the Mediterranean. The "President" was lost. The "Great Western," as is well known, after running for some time in the summer months, and after involving her proprietors in a loss of unknown amount was sold. Of the "Great Britain" the fate is well known.

I am unwilling for a moment to suppose that Mr. Clarke wilfully misrepresented what Dr. Lardner stated, but there appears to be some confusion in the passage I have quoted from Mr. Clarke's paper, as the meeting of the British Association in 1837, took place at Bristol, and not at Liverpool, and the question of "coal depôts," between England and America, does not appear to have been even raised. It is obvious that vessels of such great carrying capacity as the "British Queen," the "Great Liverpool" and the "Great Western," could not require to replenish their coal in a voyage of only 14 or 15 days duration.

It is however a well established fact that without a government subsidy of a considerable amount such lines of steamers cannot be permanently maintained, and it is chiefly owing to this cause that the Cunard line of steamers to America, with an annual grant from the British Treasury of £145,000 per annum, has been maintained with regularity:—while in the case of the Australian mail steamers, with a large subsidy, they have totally failed in performing the voyage with anything like regularity or certainty.

I am unwilling to add more to this communication except to express the belief that Mr. Clarke must have misunderstood what Dr. Lardner stated at the meeting of the British Association, held at Bristol, in 1837.

I am, Sir, your obedient servant,

FREDK. S. PEPPERCORNE.

Cassino, Richmond River,
April 5th, 1859.

From our own Correspondent.

Magdalen College, Oxford,
February 8th, 1858.

Among the numerous plans and suggestions which the failure of the Atlantic Telegraph Cable has called forth, Mr. Hearder, a well known electrician of Plymouth, has communicated to the Philosophical Magazine an abstract of a Lecture on the subject which contains much that is new to those at least who are not practical electricians. The great difficulty, says Mr. Hearder, is the immense resistance caused by such a length of wire. Resistance being taken to mean just the converse of conducting power is of course directly as the length inversely, as the thickness; in other words for a line 100 miles long to conduct as well as one 10 miles long, its transverse section should be twice as great. The difficulty of communicating through a wire of the enormous length of the Atlantic Cable must thus be immense and is farther increased by facts now to be mentioned.

The electrical condition of an insulated wire in water is very different from that of a free wire on land; it represents in fact a Leyden jar. The copper wire represents the internal coating of the jar, the gutta percha, the glass, and water, the outer coating. It may be similarly charged by sending in a current at one end and discharged by completing the circuit with the earth, i.e. sending a message. When a current is sent through, the resistance it experiences in making the complete circuit, causes a powerful tendency to pass out laterally, and if there is any aperture in the insulator it is sure to complete the circuit in this way and thus the message never reaches its destination, even however if this is not the case another difficulty occurs; the electricity exercises what is called an inductive action on the inner surface of the gutta percha, charging that with the same kind of electricity (i.e. positive or negative.) This charge endeavours to return into the wire, and when this resumes its neutral condition the ends being connected with the earth the current flows out from the centre towards either end. As this secondary current often lasts three or four times as long as the primary one, it of course exercises a very perplexing influence on the recording instruments: in fact since Mr. Hearder's remarks were printed, it appears from a notice in the *Times* that the instruments in Newfoundland recorded a message "Daniell's in Circuit," which considerably raised the hopes of the enquirers some time after the station at Valentia was shut up and deserted. As this inductive action is especially produced by electricity of high tension, it is best overcome by diminishing the intensity of the current. This however can only be done by increasing the diameter of the wire since with so small a conductor, electricity of great intensity is absolutely essential: of course the surface of the gutta percha, and so, its inductive capacity must be increased at the same time but manifestly not in so great a degree since the former would vary as mass, the latter as surface. These considerations shew the undesirableness of using so small a wire and there are other disadvantages which Mr. Hearder considers to be connected with it.

In the first place the species of electricity used, namely *statical* as distinguished from *dynamical* has little influence on the magnetic recording instruments and the effect can be produced only by repeated shocks.

Moreover instruments adapted to the recording of statical currents are especially obnoxious to the influence of the secondary statical current from the gutta percha. This static charge too increases in a much higher proportion than the intensity of the current.

Much time is in consequence lost in waiting till the wire has cleared itself of these secondary currents and as shown by the instance quoted above it is even then uncertain. Under the most favourable circumstances a greater speed than one word per minute was not attained.

The great loss of power consequent on transmitting a current through so great a length of wire is shewn by the fact that in the experiments at Plymouth, a current which caused the brilliant combustion of thick copper wire produced a scarcely perceptible throb in the tongue after passing through some hundreds of miles of the Cable.

Mr. Hearder also considers the instruments used to have been defective in principle as well as probably in workmanship. In his opinion the sort of current required, namely an intensity—rather than quantity—current or statical rather than dynamical-would be best obtained by a battery consisting of a large number of elements of small size. Mr. Whitehouse, the Electrician to the company, used in the first place a large battery consisting of silver and zinc plates, but carbon was afterwards substituted for the former. He secured intense currents by using the secondary current from a large pair of induction coils, these however appear to have been rather hastily constructed and in Mr. Hearder's opinion (derived from inspection) the currents derived from them are deficient in intensity, too great quantitatively and not sufficiently instantaneous.

It is suggested that the present Cable though hopelessly injured for the transmission of messages may still serve for the return current instead of working to earth.

The same periodical contains a paper by Professor Trowbridge, on Deep-sea Soundings, which throws considerable doubt on the reports of the enormous depth of the ocean. These difficulty of the investigations according to the learned professor, arises not as the popular hypothesis is, from the increase of density in the ocean at great depths preventing the lead from sinking; such an increase is from the very slight compressibility of water, impossible. The pressure increases with the depth in the proportion of 13lbs. the square inch for every 34ft. but the density does not increase in the same proportion. Thus at 3000 fathoms depth the pressure on the square inch is 8000lbs. but the column of water is only shortened 60ft. The effect of this pressure upon porous bodies such as wood &c., is even the reverse of what is popularly supposed; by making them denser it causes them to sink more rapidly. The real difficulty in these cases, arising from the friction of the water on the line, is sufficient however, to invalidate the authority of many observations. This friction is, after a few thousand feet generally equal to nearly the weight of the lead, and sufficient to stop motion entirely at 2000 or 3000 fathoms at furthest. The resistance on 1000 fathoms of line a ½ inch in diameter moving at the rate of 3ft. per second would be 25 or 30lbs.; if moving at 6ft. per second 100 lbs. Thus it would appear thatthe fam oussounding of H.M.S. Herald by Capt. Denham, in 1852, between Rio Janeiro and the Cape of Good Hope was quite fallacious. This was made with a 9lb. lead and a line 1/10 inch in diameter, which is said to have run out for nearly 9 miles. It is recorded that the velocity at 3000 fathoms depth was 2ft. per second, which is impossible since the resistance would be more than 3 times the weight of the lead. Moreover at 2000 fathoms a velocity of 2½ feet per second is recorded, and in fact at all depths below 1000 fathoms an impossible velocity.

I give the above remarks for what they are worth but it must be remarked that the learned professor has not taken into consideration the weight of the line. Nine miles even of thin cord must weigh something, even on the professor's own showing this would be increased by the pressure of the water.

I may mention that we are to have a periodical devoted to Ornithology, entitled the "Ibis." Germany has for some time supported more than one, and as this will appear under favourable auspices a long and useful life may be expected. Its editor is to be Mr. P. L. Sclater, a gentleman whom it would be hardly a compliment to call a rising Zoologist, but whose name is not so much known as it ought to be to the public generally.

The cultivation of silk in France will perhaps be much extended by the introduction of a new sort of silk-worm. Mr. Guerin Menville has succeeded in naturalizing the Bombyx Cynthia, a much larger species than the common one and said to be more hardy and produce more silk. It is indigenous to China where it feeds on the Varnish Tree (*Ailanthus Glandulosus*) and is said to clothe with its produce the humbler classes. It is proposed to make plantations of the tree and place the young worms out in the spring. In this way one crop might be obtained in June and a second in August.

METEOROLOGICAL TABLE.

MARCH, 1859.

OBSERVATORY, SYDNEY, LATITUDE 33·52 SOUTH; LONGITUDE, 151·12 EAST HEIGHT ABOVE THE SEA, 145 FEET.

Day.	Barometer corrected to 32 deg. Fenht.		Wind. Direction.		Force.		Temperature. Max.	Min.	Cloud Extent.		Rain in Inches.	Remarks.
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M.	9	9		
1	30,028	29·845	N.N.E.	N.E.	3	3	75·4	62·4	0	1	·240	Fine throughout
2	29·805	·749	0	E.N.E.	0	2	82·7	65·0	0	9	·393	3 p.m. S.W. squall, with thunder; thunderstorms all the evening.
3	·679	·727	N.W.	S.	1	4	77·6	65·4	2	0	...	Fine.
4	·722	·635	E.	N.W.	2	1	74·8	66 0	8	1	...	Fine; 9 p.m. lightening to S.; heavy dew.
5	·731	·890	W.S.W.	S.	2	3	73·0	60·3	1	9	...	Cool cloudy day.
6	·906	·831	S.	N.E.	2	1	70 0	58·3	8	9	...	Cool cloudy day.
7	·722	·601	W.N.W.	N.N.E	1	2	73·6	60·3	2	0	...	Fine throughout; ilghtening to S. at night.
8	·582	·585	W.N.W.	S.S.E.	1	2	78·8	58·1	7	5	...	Fine.
9	·684	·612	W.N.W.	N.E.	1	1	74·9	59·4	1	0	...	Fine; heavy dew.
10	·688	·847	W.	S.E.	1	3	86·5	60·1	0	5	...	Fine; wind to S.E. 8 p.m.
11	·900	·834	E.	N.E.	2	3	78·3	65·6	4	2	·010	Fine throughout
12	·867	·882	S.E.	S.S.E.	1	2	80·4	63·9	8	1	...	Very light showers 11·30 a.m., and 8·30 p.m.
13	·881	·767	W.	N.E.	2	3	76 0	63·5	10	2	·002	Fog; cleared 9·30 a.m.; fine.
14	·925	·878	S·W.	S.S.W.	3	2	71·6	65·4	10	10	·058	Showery all day from 7 a.m.
15	·787	·686	W.S.W.	E.N.E.	1	1	72·5	62·2	10	0	·142	Shower in the morning; cloudy
16	·752	·876	S.S.E.	S.	3	2	65 9	59·7	10	10	·103	A few light showers.
17	·960	·988	S.S W.	S.E.	1	2	70·4	58·2	9	10	·001	Cool cloudy day.
18	30·045	30·060	S.E.	S.E.	1	1	72·6	61·9	9	1	·010	Cloudy a.m.; cleared p.m.
19	·076	·064	E.S.E.	S.S.E.	2	2	73·3	55·9	9	8	...	Cool cloudy day.
20	·079	·024	N.	W.	1	1	73·5	59·9	7	0	·059	Fine throughout
21	·001	29·917	W.N.W.	N.E.	1	3	76·8	56·2	1	0	...	Fine.
22	29·904	·835	N.W.	E.N.E.	1	3	73·7	56·1	0	2	...	Fine.
23	·859	·908	W.	W.S.W.	1	1	75·2	60·7	3	4	...	Thunderstorms in various quarters all the afternoon.
24	·850	·942	W N.W.	N.E.	1	2	74·4	60·7	3	0	·002	Fine.
25	30·017	30·072	W.N.W.	S.S.W.	1	2	75·3	59·9	0	9	...	Fine; cloudy night, lightening.
26	·162	·156	S.S.W.	E.S.E.	3	2	74·1	64·4	5	4	...	Fine; light shower 7 p.m.
27	·125	·062	S.S.E.	0	2	0	74 0	61·4	9	6	·001	Fine; a few drops of rain in the forenoon.
28	29·973	29·826	N.W.	N.N.E.	1	1	74·4	57·8	0	0	...	Fine.
29	·930	·971	S.	S.E.	3	1	73·5	61·4	10	0	...	Fine.
30	·965	·810	W.	N.N.E.	1	3	73·8	57·4	0	0	...	Fine.
31	·781	30·017	W.	S.S.E.	1	4	86·8	61·4	2	10	...	Fine; strong S.S.E. wind 4 p.m
Mean.	29·883	29·868			1·5	2·0	75·3	61·0	·48	·38	1·021	Days Rain... 12

The Black Bulb Thermometer is now placed about 4 inches from the ground, and protected from the wind.
The extent of clouds is represented by the number of tenths of the whole sky, obscured at the time of observation
The force of the wind is represented according to the Observer's Judgment, by numbers from 0 to 6, 0 representing a calm, and 6 a violent storm.

HEALTH OF SYDNEY.

Registrar General's Office,
Sydney, March, 1859.

The number of Deaths registered during the month of March, was 130, viz.—79 males and 51 females. The comparative table of Deaths registered during the first quarters of the years 1857, 1858, and 1859, shows a decrease of 59 Deaths for the present year on the mortality of 1858, which is noteworthy.

Under the influence of a lower temperature the scarlatina epidemic has nearly disappeared.

No fewer than 12 Deaths by violence have been recorded during the month, and 31 during the quarter.

The number of Births registered during March, was 255, viz.—137 males and 118 females, being 125 in excess of the Deaths.

It is satisfactory to observe a large increase in the number of Births registered during the quarter, as compared with the last quarter of 1858, as well as with the corresponding quarters of the two previous years.

Births Registered during Quarter ended 31st March.

	1857.	1858.	1859.
January	192	159	182
February	151	156	208
March	183	209	255
Total	526	524	645

Deaths Registered during Quarter ended 31st March.

	1857.	1858.	1859.
January	143	167	143
February	105	125	121
March	95	161	130
Total	343	453	394

Table shewing the Deaths of Males and Females Registered in each Ward from 1st to 31st March, 1859, distinguishing those under 5 years of age.

WARD.	Under 5 Years.			Above 5 Years.			Unspecified.		Grand Total.
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	
1.—Gipps	5	7	12	11	3	14	...	1	27
2.—Bourke*	2	1	3	14	3	17	...	...	20
3.—Brisbane	2	4	6	2	1	3	...	...	9
4.—Macquarie	2	...	2	4	1	5	...	...	7
5.—Cook	4	7	1	4	2	6	1	...	18
6.—Fitz Roy	9	2	1	7	3	10	...	...	21
7.—Phillip†	4	3	7	4	5	9	...	1	17
8.—Denison	2	4	6	2	3	5	...	...	11
Total	30	28	58	4	21	69	1	2	130

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

Summary of Deaths of both Sexes Registered in Sydney, from 1st to 31st March, 1859.

Causes of Death.	Under 1 year.	1 and under 2.	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 years.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	*	Total at all ages
Zymotic Diseases. Endemic, Epidemic, and Contagious	8	2	3	2	2	17	2	...	...	1	2	3	2	...	...	...	...	...	...	1	...	...	...	...	...	...	28
Sporadic Diseases. *Of Uncertain Seat*,—Dropsy and other Diseases of variable Seat.	14	2	...	...	...	16	...	...	2	...	1	...	...	1	1	2	...	...	...	...	...	...	...	...	..	...	23
Of Nervous System.—Diseases of the Brain, &c.	7	2	...	1	...	10	1	...	...	...	...	1	...	1	1	1	...	1	...	...	...	...	...	...	...	1	17
Of Respiratory System.—Diseases of the Lungs, &c.	...	...	2	...	...	2	1	...	...	...	3	2	1	2	1	1	3	...	1	...	...	...	...	...	...	...	17
Of Circulatory System.—Disease of the Heart and Blood-vessels	...	...	...	...	...	...	...	1	...	...	1	1	...	...	2	...	...	...	...	...	...	...	...	...	...	...	5
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	7	3	...	...	...	10	1	1	...	..	1	..	1	...	...	...	...	...	...	...	...	...	...	...	...	...	14
Of Urinary Organs.—Diseases of the Kidneys, &c.	...	...	...	...	...	...	1	...	...	..	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	3
Of Generative Organs.—Childbirth, Diseases of the Uterus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Of Integumentary System.—Diseases of the Skin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Old Age	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	1	...	...	...	...	...	4
External Causes.—Violence, Privation, and Intemperance	2	...	1	...	...	3	...	1	1	2	...	1	1	2	...	2	...	...	...	1	...	...	..	...	...	...	14
Unspecified	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	3
Total from all Causes	38	9	6	3	2	58	6	5	3	3	9	9	5	6	5	6	5	2	2	2	1	...	...	1	...	3	13

CHRIS. ROLLESTON. Registrar-General.

THE MUSICAL FESTIVAL.

In pursuit of one of the objects for which this periodical was established, namely the diffusion and encouragement of a knowledge of the arts, we feel called upon to offer some remarks on the series of Musical Entertainments recently given in this city under the title of the Sydney University Musical Festival.

We have on previous occasions expressed the high value we attach to the cultivation of music as a means of refining the taste and elevating the manners of the community. Our readers will be prepared therefore to hear that the attempt to collect in this city such an unprecedented display of musical talent, had our cordial sympathy, and received our most earnest assistance.

The occasion which called forth this display was also a memorable one. Music was not the only art that then claimed honorable recognition. The most beautiful architectural structure in these Colonies was then to be publicly inaugurated. The shrine devoted by the profuse liberality of the colony to Art and Science was to be exhibited, and the pictorial art lent its charms to the scene in the glorious painted windows by which the Hall is decorated.

It was a festival, therefore, at which the arts of poetry, music, architecture, sculpture and painting, were almost equally honoured.

It is not to be wondered at that a great deal of enthusiasm was manifested. From the country districts, and even from the adjoining colonies visitors came to participate in the expected triumph, and we are rejoiced to be able to assert, that we have heard no other opinion expressed than that of the highest gratification. Indeed it is universally admitted that a greater musical treat was never enjoyed in these colonies than at this series of performances.

The possibility of performing complete oratorios in this city would have been very justly doubted a few months ago, but during this year a sort of musical furor seems to have prevailed, choral societies have been established and numerously attended, and various public classes for instruction in choral music have been opened, so that the Festival formed a very timely opportunity to display the accomplishments of the amateurs.

It was fully availed of. A chorus of voices numbering upwards of 250 was present at each performance, giving their gratuitous services in favour of this national object.

The result in an artistic point of view was a most entire success. Hundreds of persons in this colony, who had never before realised the wonderful power which the highest order of music possesses went away from these performances with new and exalted ideas of art, and some susceptible minds had doubtless forced upon their attention the grand and beneficent thoughts which had been so affectingly illustrated by the genius of a Handel or a Haydn.

A question has been raised as to the propriety of the musical performance of sacred words and passages of scripture by persons not acknowledging any special sense of religious impressions, and with a view to amusement only. We do not think that this is the place to enter into a theological argument, but we would only suggest to the well meaning, and doubtless devout objectors to the sacred oratorios, that the impropriety they see in professional singers chanting portions of the scriptures is not greater than that professional printers should be employed to print them, or that possibly irreligious stone masons and bricklayers should be employed to build a church intended to be devoted to the worship of God.

The musician endeavours to publish in a solemn and most impressive manner the words of sacred writ, the printer is employed to diffuse the same words by means of printing types, and yet it is never suggested that the compositors who set up the types of a Bible should be specially selected as pious men, nor do we imagine that any severe scrutiny is made as to the consistent christian life of the organ blower in a place of worship. The objection appears to us to savour very much of a narrow and sectarian spirit, and to indicate an assumption of self-right ousness very foreign to the humble and charitable judgment of others, that should distinguish the true christian.

The influence which this Festival will exercise on the taste of the community cannot be estimated. Hundreds of in-

dividuals have had new impressions given them of the power of music. Even the performers themselves finding what grand effects are capable of being produced by the aggregation of numbers will, we may be sure, not rest satisfied without a repetition of the effort. The great difficulty that is felt is the want of a suitable room.

This is in fact one of the greatest wants in the city at the present moment, and it is one that we see no immediate prospect of remedying. It is true that the corporation have for some time past held out hopes of the erection of a Town Hall containing a room of adequate size, but the financial difficulties in which that body seems to be involved forbid us to hope that this desideratum will soon be supplied by them.

It is also true that a plan is before the public emanating from the committee of the School of Arts, in which is included the erection of a large Hall capable of containing upwards of 1000 persons, but there is very little hope of this part of the plan being carried into effect for some time to come. The performance of sacred music within the walls of a theatre would probably be attended with pecuniary loss as hundreds of persons would not attend, who would have no objection to enter a public Hall for the same purpose.

We trust therefore that one of the subsidiary benefits conferred by the Musical Festival will be the speedy erection within the city of a fine Hall available for concerts, public meetings, and similar purposes.

To the musical amateurs who assisted on this occasion with such disinterested zeal and devotion, too great praise cannot be given. Indeed nothing in our experience in this colony has ever occurred which has called forth such sustained, and generous enthusiasm. That hundreds of ladies and gentlemen should give up their time for a whole week, and exert themselves in the way in which the amateur members of the chorus and orchestra did, undeterred by the most tempestuous weather, is to us one of the most gratifying features of the whole Festival.

It proves that in spite of all the allegations of indifference and apathy made against the inhabitants of Sydney, music possesses charms that can call forth their energies, and extinguish for a time the prevailing passion for money getting which is too prevalent and too absorbing in this community.

PHILOSOPHICAL SOCIETY OF NEW SOUTH WALES.

TWENTY-SIXTH Monthly Meeting of the Philosophical Society of New South Wales, held on Wednesday, June 8th, 1859, in the Hall of the Australian Library. The Honorable E. Deas Thomson, Esq., C.B., in the chair.

The following gentlemen were duly elected ordinary members, viz :—Dr. Boyd, Dr. James Cox, Rev. C. C. Kemp, and Joseph Burgon, Esq.

Six new candidates were nominated.

The Chairman laid upon the table for the inspection of the members, a specimen of the late Atlantic Telegraph Cable, and too specimens of Allan's Light Submarine Ropes. One from the great Indian Sub-marine Telegraph and Extensions, having 3 conducting wires and weighing 14 cwt. per mile, with a specific gravity of $\frac{1}{4}$; the other from the great Ocean Telegraph, weighing 10 cwt. per mile, with a specific gravity of $\frac{1}{8\frac{1}{2}}$.

The Chairman remarked, that in a cable constructed on these principles, suitable for the distance between England and America, the core or conductor is composed of a solid copper wire, surrounded with *steel* wires, capable of bearing a strain of 15 cwt. without *stretching*—its weight 10 cwt. to the mile, and only 2 cwt. in sea water ; the weight of the Cable, therefore, could not in any degree injure its electrical qualities, as the core or conductor alone is capable of bearing a weight of 7 miles of Cable hanging vertically from the ship. That the conducting power is greater relatively by 120 per cent. than that of the late Atlantic Cable—whilst the insulating medium is much thicker, and prepared so as to withstand heat and pressure. It is further protected by a coating of tarred hemp which adds considerably to the strength of the Cable as a whole, the breaking strain being upwards of two tons.

That under this system it is calculated, their will be comparatively an economy of 40 per cent. on the first cost of construction, besides 50 per cent. on the working.

Captain Ward laid on the table a specification, with explanatory drawings, of a Twelve-head Stamping Mill on the principle of those in operation at Clunes, Victoria. These papers contain all the information necessary to enable a similar Mill to be erected in any part of this Colony. The cost of erecting such a machine, at Sydney prices, is estimated by Mr. Trickett, of the Royal Mint, at £550. The specification has been prepared with great care by Mr. H. A. Thompson, the directing engineer of the mining operations at Clunes, and the drawings by Mr. Dumaresq, assistant engineer at the same works. On Captain Ward's visit to Clunes, last year, these gentlemen obligingly offered to furnish him with any information he might desire, and at his request forwarded the documents laid on the table. Mr. Thompson, on forwarding the specification, says "I have at length been able to complete the specification of Crushing Machinery, and enclose it together with tracing (from a drawing of Mr. Dumaresq's) of our No. 4 battery, also a rough pen sketch of an improved battery with front, back, and side escapes—which will crush 150 tons of quartz per week. Any additional explanation I will readily furnish, but it should not be forgot that good machinery is of little use without experienced men to work it, and I would recommend any person, undertaking this, to spend a few weeks in a good establishment in this colony. There is a good deal of opposition to the granting of leases on these gold-fields, but the new system is gradually making way, and will eventually supersede individual mining. Several small mining companies have begun work at Clunes, erected their own crushing machinery, and find quartz yielding half an ounce of gold per ton affords good profits. What a future this opens to Australia.

Let me hear from you when I can be of any service, and believe me,

Very truly yours,

(Signed) H. A. Thompson."

P.S.—Mr. Dumaresq is still with us, but would like to have a separate charge. If such a person is wanted in New South Wales to erect, and take charge of a crushing establishment. He is open to an engagement, and is fully competent for the office."

Captain Ward moved, and the Rev. W. B. Clarke seconded, and it was carried unanimously, that the thanks of the society be given to Mr. Thompson and Mr. Dumaresq for the valuable information furnished by them.

Captain Ward reported to the meeting that the Microscopical committee had met twice at Government House, and that a draft report had been prepared, but in consequence of the unavoidable absence of the President, who is in possession of the document, the presentation of the report must be postponed until the next Meeting.

Mr. Henry A. Severn then read his paper "On the construction of Specula for Reflecting Telescopes."

Mr. Christopher Rolleston's paper "On the means of Deodorizing and Utilizing the Sewage of Towns," was postponed until the July Meeting.

The Honorable William Bland, Esq., M.L.C., read his paper "On Atmotic Navigation, which was illustrated by several diagrams.

The meeting then adjourned until the 13th of July.

SPECIFICATION OF A TWELVE-HEAD STAMPING MILL FOR CRUSHING QUARTZ,

By H. A. Thompson, Esq., Mining Engineer, Victoria.

SITE.

Where practicable, this should be from 40 to 50 feet above the valley so as to afford room for heaping the waste tailings. Although this may entail the necessity of lifting the water, the expense will be less than would be incurred by having to remove the sand flowing with the water from the machinery.

FOUNDATIONS.

A platform should be made on the side of the mill by cutting down to a clay bed, or to the rock where the latter is near the surface; the excavated soil being thrown out in front to form the floor of the crushing house. On this platform is built the foundation, consisting of two layers of sound logs, squared on two sides, and not less than 15 inches by 12 inches in section; the lower tier to consist of 6 logs each 8 feet long, and the upper tier of 3 logs, each 16 feet long. The logs must be set level, let into each other a depth of 2 inches, and pinned together with treenails. The spaces between the logs must be firmly built in with rubble masonery.

Note.—For the battery with side escapes, there should be 8 logs in the lower tier, and the 3 logs in the upper tier should be each 20 feet long.

FRAMES.

These are 4 in number 8 inches by 15 inches in the upper part, and 8 inches by 17 inches below (as shown in section), and 13 feet 6 inches in length. They are let into foot pieces with a tenon of 12 inches, and each frame is fixed to the front log of the back stage with an inch bolt passing through frame and log. The foot pieces (12 inches square in section, and 6 feet long) are let into, and pinned to the foundation logs.

Note.—For the battery with side escapes, 6 frames are required, and the side escapes 10 inches by 8 inches are cut out for the lower part of the frames at the required height.

FRONT AND BACK BOARDS.

These are of 3 inch pine boards dovetailed together, and the joints made water tight with strips of flannel steeped in tar. They are fastened to the frames with straps of bar iron (3 inches by $\frac{3}{8}$ inches) on the point and back—each pair held together by 5 bolts 1 inch thick passing through the frames. The foot pieces of the frames are joined together at the front and back by cross logs 12 inches square in section, let into them flush with the frames and upper and lower sides of the foot pieces. The bottoms of the front and back boards are let into a groove 3 inches deep, in these cross logs and foot pieces slightly wedged against the frames.

Note.—In the battery with side escapes, the back board is continuous the whole length of the battery, but the front board is divided into three parts, one for each coffer. The screws for fixing the front and back grate frame glands must be put in at the side escapes.

ESCAPES.

These are 30 inches by 8 inches, and around the inside of the opening is a lining of iron-plate $\frac{3}{8}$ inches thick projecting within the escape, opening for $\frac{3}{4}$ inch to retain the grates and frames. The latter are made of 3 inches by $\frac{1}{2}$ inches bar iron with two vertical pieces dividing the frame into 3 equal compartments to support the grates. The glands for fastening the frames are made of 2 inches by $\frac{3}{8}$ in. iron bar; the frame bolts corresponding with the escapes, have screws at each end, with 3 nuts, and on these the glands are fitted. The grates may be of brass, or iron-wire gauze with from 64 to 256 inches to the square inch, according as coarse or fine crushing may be required. Perforated copper or iron plates about $\frac{1}{16}$ of an inch thick are also used. Wooden shields are hung before each escape to throw down the splash. They are fastened to the front and back boards with leather hinges above the escapes, so as to admit of their being turned back and looped up when not required.

Note.—In the improved battery the side escapes are 10 inches by 8 inches in area, and finished in the same way as the front and back escapes.

COFFERS.

For 12 inches below the escapes and 6 inches above them the coffers are lined with 4 in. by $\frac{1}{2}$ in. bar iron fastened to the wood-work with spike nails. The beds are formed by beating in broken quartz with the stamps adding only sufficient water to prevent the dust from rising, for from 24 to 48 hours, until a hard concrete bed is formed, and this is then cut down to a depth of 8 inches below the escapes. On this solid bed is placed loose quartz, in which is set two loose cast-iron beds 12 inches square and 3 inches thick, the top sides level with the escapes for breaking on. These loose iron beds and the quartz in which they are set are kept in motion while the stamps are working, and when the gold is liberated, the bulk of it passes round the beds and down into the loose quartz where it remains until the coffers are cleaned out, which should be done at least once a-week when the battery is in full work. Cast-iron box beds may be used instead of the concrete beds, and are more readily cleaned out.

BRACES.

These are made of hardwood, 8 inches by 5 inches in section and 10½ feet long, and are let 2 inches into the frames. Along the upper part of the brace a wrought-iron bar 3 inches by $\frac{3}{8}$ in. is let flush into the wood and fastened with $\frac{1}{4}$ in. bolts through the brace, with the bolt heads flush and nuts on the outside. The braces are fixed to the frames with iron glands 3 inches by $\frac{3}{8}$ in., wrought into one-inch bolts where they enter the frames; these bolts pass over and under the back brace, the latter being retained in its place by a plain iron gland 3 inches by $\frac{3}{8}$ in., another one-inch bolt passes through the centre of the glands and braces to give additional firmness to the work. The upper back brace is divided at each of the inner frames about the centre of the plain iron gland to allow of the lifters of one coffer being taken out while the other coffers are worked. Opposite each lifter a space is cut out of the brace 3 inches across by 2 inches in depth to receive the guide blocks, between these spaces are iron plates 3 inches by $\frac{1}{4}$ in. The blocks are held down by plain iron glands 2 inches by $\frac{3}{8}$ in.; the latter being fastened with $\frac{3}{8}$ in. bolts passing through the brace with the heads let in flush on the inner side and two nuts on the upper side. A square ended regulating screw is fitted to each block.

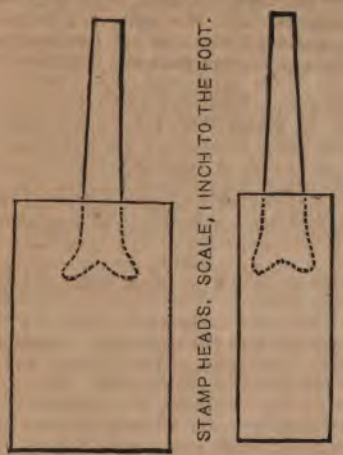
Note.—In the battery with side escapes, 3 braces will be each 15 feet long, and instead of the upper back brace there will be 3 braces, (one for each coffer) each 4½ feet long.

GUIDE BLOCKS.

The blocks for the lower braces may be made of any hardwood 3 inches by 4 inches by 6½ in size, with a V groove for the long guide to work in. The upper blocks should be of cast-iron, cored to render them lighter, with brass or cast-iron V socket guides fitted on the end in such a way as will allow of their being readily replaced when worn out. They should be set accurately with a plumb line, and to facilitate this the upper blocks should be only 2½ inches wide and be fitted in the brace with side wedges. When working, care should be taken to keep them well oiled and not to screw them up too tight.

LIFTERS.

These are of hardwood 6 inches by 5 inches in section and 12 feet long. The heads are 6 inches by 10 inches in section and of length



in proportion to the required weight, say from 15 inches to 18 inches. They are made of white iron cast into a wrought-iron shank, the end of the latter being split to prevent it from drawing out of the head—a head cast of good metal should bear 3 months' work. The

LIFTERS.

a a IRON BENDS. b b MORTICE.

lower end of the lifter is morticed to receive the wrought-iron shank of the head, and two bands of 2½ inches by ¼ in. bar iron are shrunk round it. Some thin soft wood wedges are placed round the mortice, and the lifter is driven into the shank with a spring ram. The tongues are of wrought-iron and

TONGUES.

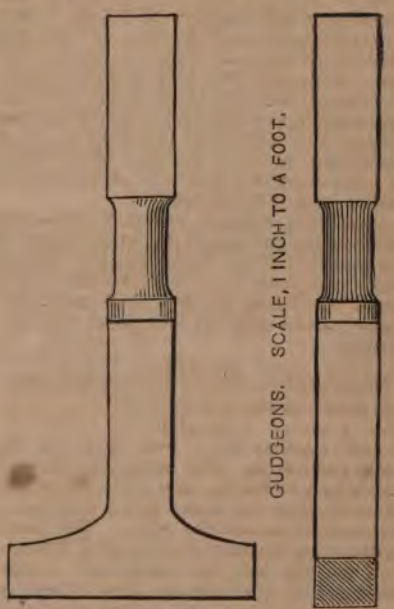
SCALE, ONE-EIGHTTH INCH TO A FOOT.

have the underside faced with steel, the feeding tongue having a longer shank than the others to catch the feeding-iron of the hopper. When the shank of the tongue is driven through the lifter, square iron washers are slipped over it and the whole fastened with an iron key. The long guides are made of 1¼ in. square flattened at the ends and pierced for the bolts, they are let angleways into the lifter and fastened with ⅝ in. bolts at each end.

Note.—Bar iron is now much used for lifters instead of wood, and may easily be adapted to the above plan or working.

CAM BARREL.

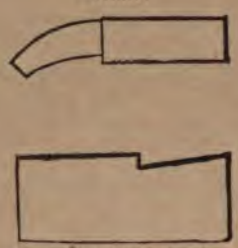
When made of wood, this should be of close grained sound and well-seasoned timber 17 inches diameter in the middle, and 16 inches diameter at the ends. It has 10 hoops made of 3 inches by 1¼ in. bar iron, viz., two opposite the inner frames, and four at each end for securing the gudgeons; also 10 hoops



of 2 inches by ⅝ in. bar iron to be fitted between the cams. These hoops should be cafreully shrunk on. The gudgeons may be either T or L shaped, and are made of bar iron 4 inches square. The ends of the barrel are morticed to receive the gudgeons, and after the latter are fitted in and the hoops shrunk on, as many iron wedges from 9 to 12 inches long as can be got in should be driven in to the end of the cam barrel.

The iron cam barrel is preferable, and the best form is an iron shaft 5 inches square, on which is keyed three hollow cast-iron cylinders (one for each coffer) fitted together with wrought-iron dovetails, through which the fastening bolts pass. These cylinders must be cast with mortice holes to receive the cams. These cams are of wrought-iron with steel face and are keyed into the mortice holes of the barrel with iron keys.

CAMS.



SCALE, ONE-EIGHTH INCH TO THE FOOT.

Note.—In the battery with side escapes, the iron cam shaft should be 6 inches square with 5-inch bearings. The cylinders may either have distance pieces or be distinct, each keyed into the shaft.

HORSES.

The foot pieces are 15 inches by 13 inches in section and 21 feet long. The cap pieces are 13 inches by 13 inches in section and 21 feet long. On the cap pieces are blocks 6 inches by 13 inches in section and 4 feet long for supporting the plummer blocks of the cam barrel. The general arrangement of the framing is shown in drawing, but it would be an improvement to give the uprights 2 feet more splay at the bottom.

The back stage is formed of two logs 12 inches by 6 inches in section, set two feet apart with ends dovetailed into the cap pieces; the space between the logs is fitted with 6 inches by 2 inches cross pieces set 2 inches apart and laid flush into mortice in the logs, so as to be easily removed when required. The front stage is formed of hardwood 6 inches thick and 20 inches wide let into the cap pieces at each end.

HOPPER.

This is supported in the front by 6-inch posts, and at the sides by two logs 12 inches square, resting at the back on the framing, and in front let into the cap pieces, and fastened to them with 1-inch bolts. The bottom should be strongly framed, and the whole covered with hardwood planking 2 inches thick, ½-inch battens being nailed over the joints. In front are the escape holes corresponding to the feeding hoppers with sliding doors for closing them.

FEEDING HOPPERS.

These are made of 3 inch pine boards bolted together, and are 15 inches by 12 inches outside measure, and 4½ feet long; the upper end rests on, and is bolted to a wooden roller, resting in sockets attached to the front standards of the large hopper, and the lower end is supported on an iron spring 4 feet long, made of 1 inch by 4 inch bar iron as shown in the drawing. The projecting bottom of the large hopper fits loosely into a notch 4 inches deep in the upper end of the feeding hopper, while the lower end of the latter passes within a guard, made of boiler plate attached to the back board, and intended to keep in the splash—across the mouth of the hopper is fitted a strong bridge of hardwood to receive the feeding iron passing up through the back stage. This feeding iron is 4¾ feet long, and made of 1½ inch by 2 inch bar iron; at the top is a T piece to catch the long tongue of the feeding stamp; at the lower end is a shoulder, and plain piece passing through the bridge, so that the length above the bridge can be regulated to some extent by the insertion of washers.

WATER TROUGH.

This is made of pine and fitted on the top of the back board, the water being conducted into it from a cistern behind the works by means of 2-inch gas pipes with tops to regulate the supply. Holes are bored opposite each coffer in the sides of the trough for affording the required amount of water.

APRON, &c.

This is 20 inches wide made of 1-¼ inch Scotch flooring boards, and closely fitted to the front board; pine wood troughs convey the sand and water from the back escapes, and deliver them into a front trough over the apron, having the inside lower than the outside, so as to distribute the material equally over the apron. From the latter the material runs into a first trough, and is from thence distributed over the strikes.

Note.—In the battery with side escapes, there is a back apron 12 inches wide, also aprons for the side escapes, all these are fitted with leather strips at the joints to receive blankets intended to retain a large proportion of the gold before the sand passes to the strikes.

STRIKES.

These consist of 5 floors extending the whole width of the battery, each 3 feet long with a fall of 3 inches from one to the other. They are made of 1½ inch tongued and grooved Scotch flooring boards closely jointed, and each floor has an inclination of 1 inch to the foot. Provision should be made for attaining the incline at pleasure to suit the quantity of water used, and the material operated on. These floors are divided into strikes by means of 2 inch square battens nailed down on them at 15 inches apart. On these strikes are laid the blankets for catching the gold. Across the top of the strikes, and immediately under the disturbing trough is nailed a strip of leather 6 inches wide, under which the upper end of the top blanket is tucked. A trough runs across the bottom of the strikes for collecting the sand and water as it passes off.

WORKING.

In working a battery the second lifter in the coffer is usually selected for the feeding stamper, and the tongue should be set so as to strike the feeding iron when the quartz in the coffer is below the proper quantity. Care should be taken never to have too much in the coffer, or the stamps will do little work. The speed should be about 80 blows per hand, per minute. The blankets require close attention, and the supply of water and inclination of the strikes should be so arranged that the sand will barely run off; indeed until some experience is gained, the sand should have a slight tendency to accumulate on the blankets, but must not be

allowed to clog them. The top blankets should be changed every 2 hours, the middle blankets every 6 hours, and the tail blankets every 12 hours. The blanket sand is amalgamated in the common barrel amalgamator, and the same afterwards washed off in a small shaking table.

ON THE MEANS OF DEODORIZING AND UTILIZING THE SEWAGE OF TOWNS.

By Christopher Rolleston, Esq.

The carefully recorded observations of a long series of years having very clearly established the fact that the chief causes of the high rate of mortality amongst urban populations are, the collections of decaying matter, imperfect drainage, and the want of pure water, the earnest attention of Local Boards of Health, acting under the Public Healths Act of 1848, has, with the aid of men of science, been directed to the sanitary improvement of the more populous towns in the mother country in these respects.

I may take it for granted that no one will be found bold enough to maintain that, at the antipodes it is not so—that the results arrived at in England are inapplicable to Sydney—that water is a superfluity—that drainage is unnecessary—and that the system of hoarding in and about human habitations the excrementitious and other foul matters incident to daily life, is not only innocuous, but absolutely wholesome.

There may be some who, by their practice, might almost lead one to suppose that all sanitary laws, in a beautiful climate like this, may be set at defiance without prejudice to the public health; but in the fact that the natural annual rate of mortality (namely 17 in 1000), is very greatly exceeded, we have ample evidence of the existence of many social evils amongst us detrimental to human life, and calling loudly for remedy; and it behoves us to take care that in attempting to remedy one evil we do not originate another—that in cleansing our streets and habitations we do not poison our harbour.

Large sums of money have been expended in underground works for the drainage of Sydney, but as yet to little purpose; since, out of some 2000 houses comprised within the area intended to be drained, more than 1500 are still unconnected with the sewers. Differences of opinion exist as to the wisdom of the expenditure, I mean as regards the plan adopted, but with this I have nothing to do. What I wish to impress upon the society is this, that supposing your system of internal Sewerage to be perfect, and no provision to be made for the outfall, you merely remove the mischief from your streets to your harbour—you convert your beautiful bays into loathsome cesspools—and you turn what Providence has designed to be the lungs of the city, charged with the pure, healthful, and life-giving air from the ocean, into receptacles of the most offensive matters, and dispensaries of the most unwholesome exhalations. There is no more common error than that of supposing that if you can only get rid of the impurities of your streets and houses into the water, you need concern yourselves no more about them. For to this very circumstance fatal epidemics have not unfrequently been traced.

In anticipation, then, of the attention which, as the evils arising from this cause disclose themselves, the question cannot fail to exact, I think it is an important subject for consideration what are the best practicable means of rendering the outfalls of the drainage innnocuous, and at the same time realising from the Sewage as high a return as possible?

It must be remembered that what is poison in the water, is a valuable reproducing agent in the soil, and to ignore this fact in our practice is, to set at defiance all established sanitary laws, and to disregard the first principles of social economy.

Are there any reasonable grounds for supposing that we shall be exempt from the penalties which have been found, in all countries and cities of the world, to attach to the neglect of these laws and principles?

I think not. The great and immutable course of life decay and reproduction must be accomplished; and if the elements of reproduction are not employed for good, depend upon it they will work for evil. If we refuse to restore to the soil that which we have taken from it—that which is necessary to renew and revivify that producing principle which, as by magic, clothes our fields with luxuriant verdure, and our gardens with the choicest flowers—depend upon it it will diffuse itself through the air we breathe, mingle with the water we drink, and generate in return for our neglect a rank vegetation of sickness and mortality.

In the discussion of this question, then, two important considerations present themselves; the first and paramount consideration is, that which relates to the public health; the second, the question of return for the expenditure.

Looking to the agricultural, rather than to the sanitary object, the use of water has been deprecated as a means of carrying off the refuse from the site of towns; and the cesspool system of France has been preferred as less destructive of the valuable properties of Sewage for manure. But wherever the sanitary object has been kept in view, the employment of water as the vehicle, at the same time the least expensive and the most effectual, has been adopted; and the sanitary investigations conducted in England have established the fact that, were the loss of the manure total, the pecuniary loss would be trivial compared with that arising from the excessive sickness and mortality occasioned by the retention of filth in the midst of human habitations.

If we except the expense, no practical difficulties oppose themselves to the complete removal of all nuisance at outfalls. The noxious properties of Sewage can, to a very great, extent if not entirely, be removed by well known disinfectants.

Disinfectants are divided into two classes—firstly, those which fix the organic matter in a form unfavorable to oxidation, and thus reduce its tendency to undergo chemical change; and

secondly, those which, more or less, rapidly break up the organic matter by promoting its oxidation and conversion into imputrifiable products.

The first class—namely, those which restrain the decomposition of organic matter and prevent infection, are more properly designated antiseptics. The agents which may be employed for this purpose are, heat, kreosote, carbonic acid, sulphurous acid, and various metallic salts, such as, sulphate of iron and copper, and chloride of zinc. The second class—namely, those which, more or less, rapidly promote the complete oxidation of organic matter are the true disinfectants. They are either those which supply oxygen directly, such as, nitric and nitrous acids; or those which induce in the organic compounds a condition of greater readiness to become oxidized by the air, such as, fire, chlorine, lime, and charcoal.

Experiments conducted by Mr. Blyth, Analytical Chemist to the General Board of Health, to whose valuable reports I am indebted for much of this information, show that the offensive gases given off from decomposing organic matters, are usually compounds of hydrogen, with carbon, or sulphur, or phosphorous, and ammonia, and that many of these gases may be removed by the absorbing power of porous bodies, such as, charcoal; whilst others may be broken up by the chemical action of such bodies as quick lime, chloride of lime, salts of zinc, copper, iron, manganese, and lead. These substances are more properly termed *deodorizers*; they possess the property of antiseptics and disinfectants, and in their use it will be well to bear in mind their separate properties. Thus, says Mr. Blyth, in the interior of buildings, and when sickness prevails, the disinfectants are to be preferred; but when the abatement only of a nuisance is desired, the employment of a deodorizer is preferable.

Charcoal is often used as a deodorizer. It possesses in common with other porous bodies the power of absorbing and condensing various gases within its pores; but its power of removing smells from liquids is considerably less than its power over atmospheres, because the pores being partially filled by the liquid, there remains less space for the condensation of gases. For this reason it should be sprinkled over the offensive matter so that the air may have free access to some portion of it.

Some kinds of coke possess considerable deodorizing power; and a very effective deodorizer may be prepared by burning refuse organic matter mixed with breeze or small coal, and a portion of clay, lime, ashes, or other earthy matter. Dust heaps might be mixed with lime, and carbonized, to form a valuable deodorizer, aud a very good manure.

Quick lime acts as a deodorizer by promoting the oxidation of offensive gases, forming inodorous compounds with their sulphur and phosphorous, and converting their hydrogen into water. It does not, however, act as a deodorizer when ammonia is present; its first faction being to liberate that gas which may thus escape into the air. It should, therefore, be used in combination with charcoal, or some other porous body which would absorb the ammonia, and promote its ultimate oxidation.

Chloride of lime is a more perfect deodorizer when exposed to the air. A portion of the chloride is given off, which combining with the hydrogen of the offensive gases, is converted into what is termed hydrochloric acid; and this newly formed compound combining with the ammonia, converts that gas into an inodourous salt.

Various metallic salts act as deodorizers, such as the chloride or sulphate of zinc, iron, or manganese, the nitrate or acetate of lead, sulphate of copper, or common alum; their acids combine with ammonia, their metals with sulphur and phosphorous, and their oxygen unites with hydrogen to form water. For sanitary purposes, and when the operation is superintended by a proper officer, these metallic salts may be applied to the disinfection of Sewage matter at a comparatively small cost. But when the double object of deodorizing and utilizing the Sewage is to be accomplished, their use is not only undesirable, but injurious to the manure for agricultural purposes.

As this double object is what I wish to prove a practical one, I will endeavour to show in what way it has been carried out in many towns of England, and how similar means may be made to apply to the Sewage of Sydney.

The evils resulting from allowing the refuse of towns to poison the neighbouring streams, have compelled public attention at home to this branch of sanitary reform, and many experiments have been made to determine the best means of diverting it to the land. The practicability of its application by water, depends on the levels and character of the surrounding country, the nature of the soil, and the crops, the water supply, and the extent of land available for irrigation.

Of the application of liquid Sewage, the Craigentinny Meadows, near Edinburgh, form the most successful example. The area of land consists of about 260 Scotch acres, or about 330 English. The Sewage water is conducted to the land by open channels or ditches from the stream called the Foul-burn, (into which about half the city is drained,) following the levels of the ground.

The portion of land more recently brought under irrigation is divided into squares of half an acre each. The irrigation goes on incessantly, except on Sundays, winter and summer, night and day. Two men complete the irrigation in about three weeks or a month, and then work through it again. It has been calculated that the annual depth of water passed over the meadows is not less than 6 or 7 feet; and the superintendent states that the fertility is invariably in proportion to the quantity of Sewage employed.

No attempt to deodorize the Sewage before it is conveyed to the land has been made; the system of open irrigation has, consequently, been the cause of much complaint, for although no trace of effluvium is to be perceived from any part of the land under irrigation, the

offensive deposit in the open channel or ditches, by which the liquid is conveyed to the land, is at certain times the source of great annoyance to the residents in their neighbourhood.

The cost of laying out the Craigentinny Meadows for irrigation, is said to have averaged about £15 per acre. Part of this land consists of a sea land, formerly barren and worthless; it is now let at from £9 to £11 per acre; the average rental of the whole is about £20 per acre, some portion of the land selling as high as £40 per acre.

It should be borne in mind that, it is from grass cut for stall-feeding that this value is obtained. The meadows are let in small lots every season to the cowkeepers of Edinburgh, who obtain four or five cuttings, amounting, it is said, to the extraordinary weight, in some instances, of eighty tons per acre; and this does not appear to be the limit of production, for, it is said, the more water each portion of the land receives, the larger is the crop produced.

At Tavistock, at Harrow, at Clipstone, and at Crediton, the Sewage is applied to the land by irrigation, with more or less success, without undergoing any preparatory deodorization. But, perhaps, the results of irrigation in Lombardy with the sewage water of Milan, exceed any that can be instanced in England. A very interesting account of the works will be found in the reports of the General Board of Health, but my limits will not allow me to enter into a description of these on the present occasion; indeed, I should be occupying your time unneccessarily, were I to do so, since it seems clear that this system of irrigation is inapplicable to the circumstances of Sydney. I merely introduced the description of the irrigation system of Edinburgh, to show by its results, the extraordinary fertilizing power of Sewage water, when applied to the land.

To permit the natural flow of Sewage matter to the land, considerable elevation is necessary, and to raise the Sewage of Sydney to a level high enough to admit of its flow to the agricultural lands in the neighbourhood, would entail so large an outlay, that the idea cannot at present be reasonably entertained. We must look, therefore, to other means of disposing of the Sewage with the least possible risk to the public health, and at the smallest possible cost; and I think that the experiments which I now propose to lay before you, will show that the principles on which they are conducted are eminently suitable to the circumstances of this city.

The deodorization of Sewage, and its manufacture into solid manure applicable to the fertilization of land, has been experimented on in many towns of England with various degrees of success. No less than 48 patents have been taken out within the last 50 years with this object.

As those of Mr. Higgs in operation at Tottenham, and of Mr. Wicksteed at Leicester, seem to have met with greater success than most others, I propose to describe shortly the *modus operandi* at these works.

The process adopted by Mr. Higgs, consists in an admixture of lime of the consistence of cream with the Sewage as it flows to the outfall.

The solid matters in suspension are thus precipitated, and some of those in solution disengaged, whilst the water thus deodorized, and comparatively harmless, is allowed to flow off into the adjacent stream.

The first attempt to apply this principle was at the outfall of one of the main sewers in London in 1849, which commercially proved a failure, and was afterwards abandoned.

At Tottenham, a town containing a population of about 10,000 souls, Sewage works have been erected under Mr. Higgs' superintendence, for carrying out the lime process.

These works comprise a reservoir, capable of holding 44,000 gallons, into which the Sewage is received, and then raised consecutively into four iron tanks, capable of holding 5,000 gallons each, by an engine of 10-inch cylinder, 16 inch stroke, working up to 8-horse power.

Cream of lime is poured into and mixed with the Sewage as it passes into the iron tanks. The proportion of lime used, is estimated at 1-4th of the solid Sewage, and the solid Sewage, is calculated to be on the average of 1 in 500 of the liquid; 1¼ per cent. only of this solid matter is said to be grit.

When each tank is charged, from half-an-hour to an hour is allowed for settlement, the liquid is then passed off to the outfall, and 7 or 8 deposits are made before the solid matter is removed.

The drying of the Sewage seems to have been the great difficulty, so as to render it easily portable. The last plan proposed was, to pass the Sewage in the semi-fluid state in which it is withdrawn from the tanks, round a drum in a thin layer, from which it would continuously fall on to a series of heated plates; but I have not been able to learn whether it has been attended with complete success.

The foul gases which arise on the disturbance of the deposit in the tanks are conducted to a purifying air chamber, and there treated with hydrochloric acid, and oxide of manganese; and the whole establishment is stated to be perfectly free from noxious or unpleasant odours.

The price of the manure thus manufactured at Tottenham, has been fixed at £4 per ton, which, it may be supposed, is a remunerative one to the company for their outlay and expenditure.

At Leicester, with a population of about 65,000 souls, works on a much larger scale have been established by a company, under Mr. Wicksteed's patent. The principle is the same as that adopted at Tottenham. It differs only in the modes of operation, and in the adoption of various improvements which experience has suggested.

The works were undertaken by the Solid Sewage Manure Company, who obtained a lease of the Sewage from the Local Board of Health. A complete system of public sewers has been constructed in the town, but as is the case in Sydney, a very large proportion of the houses has not yet been drained into them.

The outfall is about a mile below the town, and the whole liquid drainage is there dealt with by the lime process.

The Sewage flows into a pump well, whence duplicate engines, with 25-inch cylinders, 7 feet 6 inches stroke, and 28-inch pumps, raise it to the level of the reservoirs.

Quicklime mixed in water to the consistency of cream is raised at the same time, and discharged in certain proportions, varying from 2 to 16 grains per gallon, into the pipe which conveys the Sewage. The two are mixed by a series of agitators, and then pass through a perforated chamber into the first reservoir, where the greater part of the solid matter is precipitated. The bottom of the reservoir is sloped from 5 feet depth at the sides to 15 feet in the middle to a centre channel or trench along which an archimedian screw of 3 feet in diameter continually works, drawing the precipitated matter into a covered well at the upper end. From this it is lifted by a Jacob's Ladder of dredging buckets, alternately to one of two tanks twenty feet above on an upper floor.

The material thus raised from the reservoir is at this stage in a state of slush, and the difficulty experienced at Tottenham of getting rid of the remaining fluid has been ingeniously overcome by Mr. Wicksteed by means much more perfect, and far less costly than those hitherto employed.

A portion of the semi-fluid matter in the tanks descends through a pipe into a portable apparatus below, consisting of a pile of filtering trays secured together, from which the water is discharged by the pressure of the remaining Sewage above.

The solid matter comes from the trays of this press in firm slabs, and it is then cut by strings into ordinary sized bricks and put out to dry.

The agitators, screw, and Jacob's Ladder, are worked by a separate engine.

The first reservoir is 60 feet long by 45 wide, and the liquid Sewage passes from it at the rate of about ¼ of an inch per second, to a second reservoir 130 feet long, where further settlement, takes place; 7-8ths of the precipitation, however, taking place in the first reservoir.

There is still stated to be some perceptible smell from the water as it flows off into the river, but the fact that fish have returned to their old haunts a short distance below the works, where they had not been seen for many years sufficiently testifies to the great improvement which these works have occasioned in the condition of the river.

The works just described are said to have cost about £30,000, but this must not be taken as the necessary cost of similar works, much money having been expended in experiments necessary to bring the process to its present state of perfection.

Mr. Wickstead calculates that works sufficient for a population of half a million could be established for £40,000.

The price of the dried manure of the Company was fixed at 40s. per ton, but the supply exceeding the demand, it has been reduced to 25s.

I have before stated that the quantity of lime used varies from 2 to 16 grains per gallon; this is determined by the state of dilution in which the Sewage is received into the reservoir.

Experiments made with the water of the Medlock into which the Sewage of Manchester flows, proved that 2 grains of lime per gallon entirely removed the odour, and other experiments have satisfactorily determined that from 10 cwt. to 1 ton of lime is sufficient for the immediate precipitation of one million gallons of Sewage; and where the Sewage is highly diluted, and the subsiding area is large, so that the liquid could be left sufficiently long in suspension, it has been found that 3 cwt. of lime would effect complete precipitation by using the precipitated matter over again to fresh charges of the impure liquid.

As a precipitating agent the operation, of lime upon organic matter in suspension and solution, is very extraordinary. Supposing the organic matter to average 12 grains per gallon, it has been shown that after treatment by the lime process, only about 3 grains remain in solution, a quantity less than many river waters used for domestic purposes are said to contain.

I come now to describe a third, and perhaps the most perfect system of all which is in successful operation in the town of Cheltenham where there are two outfalls of the Sewage, and works at each of them.

I must here state that for the particulars of these, as of the former works described, I am indebted to a very interesting report of the chief superintending inspector to the general Board of Health dated as late as the year 1857.

The building at the principal outfall is divided longitudinally, forming below ground two sets of reservoirs or tanks, which are employed alternately.

The Sewage passes through vertical filters in the upper and lower tanks, whereby the great bulk of the matters in suspension is separated and retained. These filters are 5 feet deep, and 2 feet thick, and consist of coarse gravel inclosed within 2 inch perforated boards, those being protected with basket work to prevent clogging.

The heavier matters of the Sewage deposit themselves at the bottom of the tanks, but a large proportion of the solid forms itself into a floating body, and accumulates to about 10 inches thick on the surface. The liquid is conveyed from the angular filters in the upper tanks by a line of pipes in each division.

A weir, or rather division in the third or liming tank, causes the water then partially clear, to flow through a channel at each end, during its passage through which a certain portion of cream of lime mixed on the floor above falls into it, and occasions a further precipitation to take place.

The effluent water then passes through another filter of gravel finer than before, and then through a third finer still to the outfall.

When either reservoir contains a certain amount of solid matter, the flow of Sewage is cut off, and turned into the other. This takes place about every eight weeks, and the filtering medium of gravel is removed at the same time and washed.

The contents of the tanks in a state of slush, are then hoisted in buckets through the trap lids on to the floor above, and wheeled out and mixed with the scavengers' refuse of the town, the ashes, street sweepings, &c.; these are brought to the yard, and a kind of embanked reservoir is formed by them immediately outside the building, and as the semi-solid Sewage is wheeled into the midst, the dry refuse outside is turned on to it.

The liquid is at once absorbed, and after being turned over, and thoroughly intermixed, the solid mass is fit for immediate removal and use.

The ashes and dry refuse of the town are said to be just about sufficient for the purpose. They absorb about 2-3rds of their bulk of Sewage – that is to say one cubic yard of the ashes, &c., and 2-3rds of a cubic yard of the semi-fluid Sewage make only one cubic yard of solid manure.

The operation was commenced in 1855, and although the drainage of Cheltenham was by no means complete in 1857, the manure was being manufactured at the rate of about 2,000 cubic yards per annum.

By the census of 1851, the borough contained 6,968 houses, and 35,051 inhabitants.

The outlay upon the building which has been described was about £1,250.

The houses draining to it in 1857 numbered about 3,260, discharging about 300,000 gallons in 12 hours of day time. The cost of the operations of the outfall, was 2s. 2d. per cubic yard of manure, and the ashes were worth 8d. per yard.

The value put by the Local Board on the manure was as low as 2s. 6d. per yard, but as the demand exceeded by two or three times the supply, the price has since been raised. It is calculated that 3s. 6d. per yard would pay the working expenses, and interest on the outlay.

Mr. Austin states, that the operation did not appear to give rise to any nuisance, and the effluent water and solid Sewage were nearly free from unpleasant odour; but the process may, in his opinion, be conducted in so complete a manner as to obviate the slightest offensiveness even in the hottest weather.

At Coventry similar works to those at Cheltenham have been adopted.

At Ely a successful experiment has been made in treating the Sewage water with clay in conjunction with lime.

It was found that one ton of clay was sufficient to deodorize 600 tons of Sewage, but as only a small portion of the houses was drained, it is supposed that a much larger quantity will be necessary when every house is connected with the sewers.

At Hitchin an attempt was made to intercept the solid matter of the Sewage in a series of reservoirs, or open pits at the outfall of the drainage without any means of deodorizing, or arrangements for precipitating, straining, or filtering. The process was not successful; an action was decided against the Local Board for pollution of the river, which has necessitated the adoption of more complete arrangements.

And now, having detained you so long in describing the experiments, which have been attended with more or less favourable results in the mother country, I feel that I ought not to trespass on your attention by any very lengthy observations as to the feasibility of their application to our own circumstances.

It is generally admitted that the outfall of the Sewage of Sydney is becoming a serious nuisance, and an injury too to the commercial interests of the Port, and that something must be done 'ere long to remedy the evil. What do we gather then from a consideration of the facts that have been laid before us. We learn that by the lime process very much of the offensiveness of Sewage matter may be removed at the outfalls, and that the effluent water is robbed of its power for harm, although not perhaps of all its most valuable properties for manure. We learn that a solid manure of considerable value, may be made either by means of pressure, or by mixing the ashes, and dry refuse of the town with the slushy matter taken from the reservoirs. We learn that a deodorizing establishment on the plan exhibited can be put up at no very great cost, and that the quantity of lime required to effect rapid precipitation is very small. Say, ¼ a ton to a million gallons on the average. We learn that the principal establishment at Cheltenham was erected at a cost of £1,250 only; that it operated on about 300,000 gallons in every 12 hours of day-time, and that 3,200 houses are drained into it. We learn that commercially speaking it was not unsuccessful; that the demand for the manure was greater than the supply, and that the operations were conducted without offence to the neighbourhood.

We learn, moreover, that at Leicester so great improvement in the condition of the river had been effected that fish had returned to their old haunts near the town where they had not been seen for many years.

Now, I ask, do not these facts afford encouragement to us to make an experiment, at all events, on some such plan as that in operation at Cheltenham. Great complaints are made of the nuisance that exists at the outfall of the tank stream, and of that which is in the process of creation at the outfall of the main sewer at Fort Macquarie. Why should we not establish deodorizing works at one or other of these outfalls, or is it not practicable to unite the two at one outfall, and if the experiment answers, as there is every reason to lead us to believe it will, we can then establish similar works at Woolloomoolloo Bay, and others at Darling Harbour. The advantage of this plan is that the drainage system would be less expensive than that required to complete the scheme of Sewage at present projected. The natural fall of the ground from the higher parts of the city to the outfalls I have indicated

would require a formation of sewers much more modified in design, more simple in execution, and consequently more economical in practice.

We know the greater the fall, and the shorter the distance, the smaller need be the diameter of the drainage pipes, and the size of the main sewers leading to the outfalls, and setting aside the sanitary aspect of the operation, I believe it can be proved that the erection of deodorizing works at the outfalls would be attended with no greater expense, at all events, than the removal of the silt and solid matter by the dredge after it has deposited itself around our wharves and quays, choked up the channels frequented by the shipping, and done all the harm it otherwise may do. Economical considerations would certainly seem to indicate the wisdom of intercepting the Sewage matter at the outfalls rather than suffer it first to choke up the harbour and then to use comparatively abortive efforts to scoop it up again from the bottom, and carry it out to sea or elsewhere. Sanitary considerations on the other hand would no less indicate the necessity for the deodorizing process, if you wish to preserve the purity of your water, and to prevent its breeding a pestilence.

It is true that water rapidly absorbs gases evoled by decomposition *when the quantity of gas is moderate*, but where it is considerable, the water is rapidly saturated, and then is found to diffuse the gas as fast as it absorbs it, and hence the danger that is to be apprehended.

It may be that, considering the extent of water surface, the quantity of impure matter finding its way into the harbour may be innocuous—mind, I don't say that it is so—but assuming the danger not to be imminent, are we therefore to take no precautions. You have heard of the folly of locking the stable door after the steed is stolen, and it is certain that as your system of sewerage is perfected, so will the nuisance and the danger too increase.

There are as I have before stated, not 500 houses at present connected with the main sewers, and already we hear of the offensive effluvium arising at the outfalls at Fort Macquarie, I am credibly informed that at certain states of the tide, with the wind from that direction, the stench is so offensive that all the windows on the north and west sides of Government House have to be closed, and there are grounds for believing that already has this nuisance given evidence of its pestiferous influence. What think you then will it be when five times the quantity of household and street refuse comes to be discharged there? I think that the danger to the public health will be most imminent, and unless we take measures in time to avert the catastrophe, we may find ourselves exposed to the frightful ravages of some fatal epidemic, not an epidemic on its travels from abroad from which Quarantine laws might possibly save us, but one of indigenous growth, fostered and cherished under our very noses, engendered in our own harbour, through the neglect of those very precautions which it has been my object to bring under the notice of the society this evening.

I shall not be expected to undertake the task of entering into the engineering details necessary to show the feasibility of the application of the principle of deodorization, as exemplified in the works at Cheltenham, to the circumstances of this city—professional knowledge is necessary to its practical application. I shall be satisfied if the observations I have ventured to submit are the means of attracting the attention of the city authorities, or of some of our experienced engineers to this important subject.

I may add, by way of encouragement, that the Chief Superintending Inspector of the Board of Health himself propounds a plan of a deodorizing establishment sufficient for a town of 3,000 inhabitants—more simple in design, yet equally efficient—which he estimates to cost not more than £300, exclusive of the excavation of the site and the fencing, which would depend upon the locality and nature of the ground; but as this plan wants the test of actual operation and experience, I should not be justified in taxing your attention any further by attempting a description of it.

TRANSACTIONS OF THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

TWENTY-EIGHTH Monthly Meeting, held in the Chamber of Commerce, Sydney Exchange, Tuesday, May 3, 1859.

Members of Council present:—The Hon. E. Deas Thomson, V.P.; Captain Ward, Dr. Houston, Messrs. Guilfoyle, Walker, Dyer, W. M'Donell, and P. L. C. Shepherd.

The Hon. E. Deas Thomson, V.P., in the chair.

Minutes of the last meeting read and confirmed.

PAPERS READ.

The Secretary read a paper from Dr. Gunst, "On the manufacture of Sugar from the Sorghum Saccharatum and the Zulu Kafir Imphee," samples of which were laid upon the table.

The Chairman remarked that he thought the Sorghum would stand better than the Imphee in the cold parts of the colony.

Mr. Thomas Walker asked, if the Sorghum would stand the droughts of the colony.

Mr. P. L. C. Shepherd stated, in answer to the above question, that last year when maize only attained the height of 18 inches, the Sorghum had grown to the height of 8 feet.

Mr. J. H. Williams remarked, that in

the sample of molasses produced by Dr. Gunst there was still a great quantity of sugar remaining, and that the molasses must have been imperfectly prepared. Mr. Williams further remarked, that the specimens on the table were very creditable, although the sugar had not perfect crystals. The great thing for this colony was to get new productions which would add materially to the wealth of the colony; he considered that it only required proper machinery to cause it to produce as good a sugar as any imported; and thought that the thanks of the colonies were due to Mr. Deas Thomson for introducing the Sorghum.

The Chairman said, that if the sugar could be produced in the country districts, it would avoid the heavy item of transit.

Mr. Walker observed, that Mr. Blaxland was trying some extensive experiments of the feeding of stock with the Sorghum.

A vote of thanks to Dr. Gunst for his valuable paper, having been put from the chair, was carried by acclamation.

Dr. Salter laid a cob of Maize upon the table, being a monstrosity, having seven cobs joined at the stem.

Mr. Deas Thomson laid some seeds of the Sorghum, Imphee, and White Millet upon the table for distribution among the members.

The next Monthly Meeting will be held on Tuesday, June 1st.

Twenty-ninth Monthly Meeting, held in the Chamber of Commerce, Sydney Exchange, Tuesday, June 7th, 1859.

Members of Council present:—Dr. Houston, Messrs. Shepherd, Burnell, and W. M'Donell.

Mr. P. L. C. Shepherd in the chair.

Minutes of the last meeting read and confirmed.

The Secretary laid the following seeds upon the table for distribution:—Panicum tavinode, Oyster plant (order Asteracie), and Hibiscus Rosella, from the corolla of which the rosella jam of Moreton Bay is made. The first named seed was presented by Mr. F. Adams of New Plymouth, New Zealand; and the two latter by Mr. L. Duguid of Cook's River.

On account of the thinness of the meeting no papers were read.

NOTICE OF PAPER FOR NEXT MONTH.

Mr. T. W. Shepherd gave notice that he would read a paper at the next meeting on Landscape Gardening.

The next Monthly Meeting would be held on Tuesday, July 6th, 1859.

ON THE MANUFACTURE OF SUGAR FROM THE SORGHUM SACCHARATUM, AND ZULU KAFIR IMPHEE,

By Dr. Gunst.

The samples of sugar which I have now the pleasure of laying before you, are produced from the Sorghum and Imphee. These were cultivated on a piece of ground 320 yards square. I put the rows three feet apart, and in the rows the seeds were twelve inches apart. Previous to sowing I steeped the seeds in water for twenty-four hours. I did not hill any of the plants for the reason stated in a paper I read before the Society last year; but I kept the ground perfectly cleared of weeds during the growth of the plants. Upon this piece of ground I obtained 2080 canes, from which I produced 134 gallons of juice, and from this 132 lbs. of sugar, having separated 18 lbs. of molasses. The sugar, sample No. 1, has not undergone any refining process; and I think it will be considered a fair sample, considering the very imperfect manner in which it was manufactured from the want of the necessary apparatus, it being well known that the difficulty in producing a bright and dry crystal consists in the boiling process; in fact the fire at the latter end of the process cannot be too active if the sugar is not boiled *in vacuo*. It is consequently impossible in a small pot upon an open fire, and in the open air, to produce an article equal to that boiled on a large scale and with every convenience at hand; even if the greatest skill and attention were bestowed upon it, the article produced must be much inferior.

The Imphee, which I received from the Hon. E. Deas Thomson, Mr. Guilfoyle, and Mr. Silvester, is of three kinds. Three of them are very good for producing sugar; the fourth—the dwarf Imphee does not answer so well, having too much fecula and other foreign substances which render the production of sugar difficult. Mr. L. Wray has quoted in his book the Kaffir names given to these different varieties. The first is the highest and the strongest; I should call it the gigantic Imphee—the canes weigh between three and four pounds each, and each seed produces from ten to fifteen canes; the panicle is from fifteen to twenty inches long and contains great abundance of seed; the colour in maturity is sable yellow; it produces a great quantity of juice. In the second I find the grain is rather flatter and not so full as the first; the panicle bears the seed more firmly and does not hang so much; the colour is a reddish purple on a yellow ground. In the third I find that and this is very easy distinguished from the others by the appearance; the panicle is very long, the

seeds round and full, the colour black purple. The last two varieties are as good for sugar as the first, only the stalks are not so high nor the stems so thick, but they are crushed more easily than the Sorghum and give more juice. The above varieties give on an average 12 gallons of juice to 150 canes; this will, with proper treatment, yield from 14 to 16 lbs. of sugar. Imphee sugar is in every respect similar to Sorghum, and I find the Imphee yield much more sugar than the Sorghum. I prefer the Imphee for three reasons. First, it yields more and larger canes in the same space than Sorghum; second, it yields more seed and is better adapted for bread; third, it crushes more easily than Sorghum, and the same quantity of juice yields more sugar than Sorghum, and also yields a second crop. Another advantage I believe Sorghum to have in its tender growth, it is hardier than Imphee. In the beginning of spring when the Imphee was not more than three inches above the ground, it was all devoured by invisible insects, though with the most minute inspection I could not detect the slightest sign of any insects, it being always done in the night; the Sorghum was however free from these. All that I could observe was a multitude of small globules glittering like gold and only visible in shell; I think those eggs belong to a species of cryllotalpa fregarus, or mole cricket. I am the more persuaded of this from the fact that innumerable little holes were to be seen in the soil. My Imphee being thus nearly all destroyed, I was obliged to plant a second time, and in November the insects ceased their visits altogether. I cannot comprehend why the Sorghum was altogether free, my beet roots and maize being attacked

The samples of sugar I now produce, will, I think, prove that we may cultivate sugar very profitably in this country. Besides the sugar I have obtained ten gallons of good vinegar and fattened five pigs from the seed tops and thrash. I have carefully noticed the entire expenses, and found that the 132 lbs. of sugar cost me 16s. If I had had a proper mill, boilers, &c., the expenses would have been far less, and the yield of sugar much greater. My mill is my own manufacture, of a very rude description; the rollers are sixteen inches long and ten inches in diameter. I am of opinion that 40 per cent. of juice was left in the canes. I have no hesitation in stating that sugar can be manufactured in the colony at £14 per ton, paying the current wages.

The Richmond and the Clarence appear the best districts for sugar growing plants. I think too much study cannot be bestowed on this important cereal, to render it payable by the crushing of the Imphee. I have found out an improvement in the construction of the mill, which will prove of great importance in the manufacture of sugar, by which the mill will cut the seed, take away the leaves and every clasping part off the cane, and crush it at the same time. The benefit derived from this new mechanical action is considerable, one half of the labour in the process of crushing and boiling being saved. By the old process each cane had to undergo the operation of cutting off the seed, the leaves, and clasping parts by the hands, which consumes much time. By the new process the juice will be quite clear and will contain 60 per cent. less fecule or green matter, will filter easier and will undergo the process of boiling in much less time.

With a view to the encouragement of colonial agriculture and industry, I pledge myself to give to any person or company who will cultivate the first fifty acres with the intention of permanently carrying out sugar growing, the use of my invention—my sincere wish being that sugar growing may be pushed a-head and not lie dormant like cotton growing, which has been discussed for the last six years with no practical result.

THE CULTIVATION OF THE OLIVE.

By David Shepherd, Esq.,

(*Continued from page* 220.)

Now although this may be considered as only an experiment on a small scale, yet coupled as it is with the facts that small trees have produced fruit in great abundance, and that little expense is incurred in the cultivation of an Olive plantation, the result of this experiment is of the greatest importance to those who may be desirous of entering upon this branch of horticulture. Indeed where the small amount of outlay necessary for their formation, and the little care and labour required in their cultivation is considered, it is a matter of surprise that plantations have not more rapidly sprung up, and that the cultivation of the Olive has not received the same attention as the more expensive, and I am inclined to think less profitable cultivation of the grape. However, a few plantations have recently been formed, and there is every reason to suppose that the proprietors will 'ere long be rewarded for their enterprise. But it is highly desirable that the cultivation of the Olive should be more widely extended, and that all colonists who have it in their power should take up this important enterprise, which if carried out with spirit, cannot fail to prove not only highly remunerative to the individuals immediately concerned, but beneficial to the colony at large. The annual cost of our imports of Olive Oil and pickled Olives amounts to about £10,000. These imports would long before this have been rendered unnecessary had colonists been more enterprising in

this matter. But besides this large saving to the colony, a great advantage would be gained in having the oil fresh and free from adulteration.

A dry, calcareous, schistous, sandy, or rocky situation is the most congenial to the growth of the Olive. Where soils of this description exist, with a loose and permeable sub-soil, and a sloping surface, sheltered from high winds, and a distance not too great from the sea, every natural advantage that can be wished for is obtained. The Olive tree, however, will accommodate itself to soils and situations far less favorable; and there are few places in this colony, within fifty miles of the sea, where undulating land and a cultivable soil is to be found, in which it could not be profitably grown; but of course the more favorable the circumstances are, the less the cost and the more profitable the cultivation. Frequent complaints have been made by persons who have planted Olive trees in rich alluvial soils, (such for instance as the banks of the Hunter) that although their trees grow most luxuriantly, they scarcely ever produce fruit. The cause of this, is evidently to be attributed to the continued and too vigorous growth of the trees, induced by the great fertility of the soil. Now, as long as the trees continue in this state, an abundant crop need not be expected; but, I have little hesitation in saying that, when their vital energies become less vigorous, either from age or from artificial treatment, they will be found to produce large quantities of fruit. Depriving the trees of a portion of their roots is, most probably, the simplest and most effectual means by which to induce them to bear quickly and permanently. In the Sydney Botanic Gardens, the Olive planted in a poor sandy soil, produces abundant crops of fruit; the same result is observable in the vicinity of Sydney, where the soil is of a strong clayey nature.

If the land selected for a plantation be of an open friable nature, trenching may be dispensed with, deep ploughing will be sufficient preparation; on the other hand, if it be of a close and binding nature, it will be useless waste to plant without first trenching the whole to an uniform depth of at least two feet. In trenching this description of land, where the subsoil is stiff and binding, it will be found of great advantage to future cultivation to keep the original surface-soil on the top, care being taken, however, to have the whole broken up to the depth above stated.

After the land has been prepared, the intended position of each tree should be staked out, so as to insure uniformity in the plantation; the proper distance from tree to tree every way is forty feet; but if it is not intended to cultivate other crops between them, in the first instance they may be planted at half that distance apart, with the intention of removing every alternate tree to a fresh plantation when their meet together; which, under ordinary circumstances, they will do in about fifteen years.

Planting may be proceeded with at any time between the months of April and September, but May is considered the most favorable if the weather is moist. The plants should not be less than three years old, and if older, all the better. In removing strong trees it is advisable to head them down hard, that is, cut them down to within two or three feet of the ground, otherwise their growth will be much retarded. Small trees should not be cut down more than sufficient to prevent strong winds blowing them down.

The Olive may be propagated by cuttings, truncheons, suckers, layers, grafts, and seeds; but it is only necessary to mention those methods which are considered the best and most suitable to the circumstances of the colony. Truncheons are large cuttings taken from the branches, of not less than two inches in diameter, and cut in lengths of four feet; they should be planted in trenches, leaving a few inches of the upper end above the surface; the soil for this purpose should be light, friable and sandy, and so situated that it may be kept moderately moist; in three years they will be fit for the plantation; autumn and winter are the proper seasons to operate. This is, undoubtedly, the quickest method we have for getting trees into an advanced state, but it retards the trees which furnish the truncheons, whose supply for some time to come will be limited. In Europe, the general mode of propagation is by suckers, which arise abundantly from the roots of the old trees. A number of years, however, must elapse before a supply from a similar source can be obtained in this colony. The next

best, and to us, most advisable method, is grafting upon seedlings of the wild Olive which are easily obtained, and are fit for grafting when the stem has attained the thickness of a man's finger. August and September are the proper months to proceed with this operation. Very good plants may be obtained from what the Italians call novoli, which are chips of the stock or main root of old trees cut into pieces of nearly the shape and size of a mushroom, care being taken that each novolo shall have a portion of bark attached. To obtain these, the tree must generally be destroyed, and the plants are little in advance of seedlings. Propagation by layers and small cuttings is tedious and need only be practised where the other methods are impracticable. In England, stock of the common privet are sometimes used for grafting upon, but there the tree is only grown for curiosity or ornament, and it is not likely the practice will be found of any service where productiveness is the main consideration. Although the propagation of the Olive from seed cannot be recommended as a method for stocking the plantation, yet it should not be altogether overlooked. If a few trees were occasionally raised in this way, it is very probable that a variety might be originated which would suit the situation and the soil better than its parents. But this result is by no means to be depended upon; indeed the qualities of the seedling tree are oftener found to be inferior than superior to those of the parent—hence this method of propagation should only be adopted as an experiment.

After the plantation has been made, it is only requisite to keep down the weeds; should the land be required for other crops, the tillage for such will be an advantage rather than otherwise. Such crops as do not root deeply, and are calculated not to impoverish the soil to any great extent, are the most suitable.

The proper time for gathering Olives for the press is the eve of maturity, which is in April or early in May. If delayed too long the next crop is either wholly prevented or materially lessened, and the tree is only productive in the alternate years. At Aix where the Olive harvest takes place in November it is annual. In Languedoc, Spain and Italy, where it is delayed till December or January, it is in alternate years. The quality of the oil also depends upon the gathering of the fruit in the first stage of its maturity. The fruit should be carefully gathered by the hand, and the whole harvest completed as quickly as possible. To concoct the mucilage, and allow the water to evaporate, the fruit is spread out during two or three days in layers or beds three inches deep—it is then put under the mill (which is very simple) and care is taken not to crush the nut of the Olive, as the oil of the kernel is said to injure that of the fruit and cause it to become sooner rancid. The pulp covering the stone and containing the oil in its cells being thus prepared is put into sacks made of coarse linen, grass, or rushes, and moderately pressed. The oil thus obtained, is from its superior excellence called virgin oil. The marc remaining after the first pressure, is broken to pieces, moistened with water and returned to the press, from this an oil is obtained which though inferior to the former, is of good quality and fit for the table. A third description of oil, valuable to the soap maker and other manufacturers, is obtained by fermenting the marc remaining from the second pressure, and again submitting it to the press.

Pickled Olives are prepared by steeping the unripe fruit in an alkaline solution to extract a part of their bitter—the solution should be changed every twenty-four hours for about three weeks, after which pure water only must be used for a few days, when they are ready for preserving in salt and water, to which an aromatic is sometimes added.

The cultivation of the Olive cannot be too highly recommended to the consideration of every person engaged in the cultivation of the soil. To our numerous small farmers it opens up a new field of enterprise, which, although, considered in the old world one of the surest sources of wealth, requires no greater outlay of capital than that which it is in the power of all to command.

The cost of preparing and planting an acre of land with Olive trees will be about thirty-five pounds. The future cultivation will cost not more than from three to four pounds a year, but by the economy of labour on a small farm this expense may of course be greatly lessened.

The cost of gathering the fruit and preparing the oil, we have as yet (from the want of experience in the matter) no means of knowing.

In Italy and Greece, where the Olive is largely cultivated, a few trees are considered sufficient for the support of a family. A full grown Olive tree will produce yearly sufficient fruit to make from twenty to thirty gallons of oil, and in one instance a single tree has yielded as much as sixty gallons, but of course to produce such a crop this tree must have been most favourably situated as regards climate and soil.

An acre of land will contain thirty trees, and if on the average each tree produces twenty gallons of oil (in the old world the average is greater) we shall have from this one sixty-hundred gallons, which at the moderate rate of 13s. per gallon (the present price in the Sydney market being 15s.) will be worth £300. Now the expense of gathering the fruit and preparing the oil must be very great indeed not to leave a very ample profit to the cultivator.

In conclusion, I hope when the advantages to be derived from the cultivation of the Olive in this colony are made more generally known; that parties who may have it in their power may be induced to give it a fair trial, and that when hereafter they are gathering their rich harvests of oil they will acknowledge that our society has been the means of assisting in the development of some of the resources of this our beautiful land.

CORRESPONDENCE.

Magdalen College, Oxford,
March 15th, 1859.

The recent number of the "Annals of Natural History" contains an article by Dr. Berthold Seemann on the gigantic Californian tree, of which we have recently heard so much, the so called *Wellingtonia*. According to Dr. Seemann, this name should be dropped as being founded on an error when the first specimens were sent over by Lobb. Dr. Lindley founded the genus *Wellingtonia*. It has since appeared, however, that it is only a second species of the genius Sequoia which includes the redwood, (*sequoia sempervirens*) a fine coniferous tree which grows in great abundance, and to a very large size on the mountains of California, and has for some years been known to botanists. Its proper name then, is *Sequoia Wellingtonia* or *Sequoia gigantea*. The apparent restriction of the species to a very limited locality, is one of the most remarkable facts concerning it. There is no well authenticated instance of its being found more than a few miles from the spot where it was first discovered, which is now called the Mammoth Tree Grove. Nowhere, moreover, does it attain so extraordinary a size as there. It is therefore satisfactory to learn that the United States Government has prohibited for the future the destruction or mutilation of any of the trees. One had already been felled by some mercenary speculators, and the bark stripped off another for 60 feet from the ground. This which was carefully preserved for the purpose of exhibition is now set up in the Crystal Palace at Sydenham, and certainly gives an exacter notion than could be obtained in any other way of the appearance of these mighty trees. That from which this bark was taken is said to be 327 feet high, and one which is fallen (evidently not by the agency of man) is calculated to have been 450 feet in height.

It is natural to suppose such mighty organisms must have taken an enormous period for their development, and those who first investigated the subject assigned an age of 3000 years to one specimen. This would seem to be mistaken, as are also the calculations of Dr. Asa Gray which are in fact founded upon another species, the redwood. Dr. Farrey, however, counted 420 rings in the radius of 11 feet 3 inches of one specimen, so that the supposed age is reduced considerably. That their enormous size is owing rather to rapidity of growth than to age is rendered possible by the experiments of Mr. Reed on young specimens, which shew very rapid growth, and that this only takes place between 6 a.m., and 6 p.m.

It is now far from an uncommon plant in English nursery gardens, and as it grows so freely and rapidly well, it is to be hoped to be in time a conspicuous ornament of our parks. It has already borne fruit in some instances.

At a recent meeting of the Geological Society, a report communicated from the foreign office was read, on the coal brought by Dr. Livingstone from the mouth of the Zambesi. It is described as free burning with little tendency to cake, and containing little sulphur or iron, but yielding a good deal of ash, and little gas. As this specimen, however, was taken from very near the surface, it may be hoped that deeper excavations will give a better quality. If the Zambesi is ever to be a channel of trade, it will be of considerable importance that good coal should be obtainable.

The beautiful method of Mr. Cartmell for recognising the alkalies by their power of colouring flame, alluded to in a former letter, is coming into use in laboratories, being by far the most accurate means we possess of ascertaining the presence of small quantities of potassa mixed with soda. It is now found that instead of Indigo solution, there may be substituted with even better results a dye obtained about two years ago by Mr. Perkin, of the Royal College of Chemistry, and now under the name of Tyrian purple extensively used in manufactures. Chemically speaking,

its composition is rather obscure, but it appears to be an indigo. It will be one of the novelties at a lecture which Dr. Odling is to deliver at the Royal Institution on Mr. Cartmell's process.

Dr. Faraday in his volume of chemical researches recently published, still reasserts the theory which he expects to supersede the Newtonian theory of gravitation. His objection to that is the same which he formerly put forward. The notion of a force which decreases in the ratio of the squares of the distance seems incomprehensible to him; or in other words he says something must have become of the force which is thus lost. The true answer to this objection lies in the region of mathematics, but independently of that, the analogy of heat and light would seem to be a very natural solution of the difficulty. We know that the amount of heat transmitted to any body from a radiant centre is less for a greater distance, and this we explain by saying that fewer rays fall upon it. Similarly if gravity be regarded as a force radiating from a centre, it seems by no means inexplicable that the amount received by a given mass should decrease in a certain ratio with the increased distance. There is no reason to suppose any *loss* of, force, only the same mass receives less of it.

Oxford has to mourn the loss of an indefatigable scientific labourer, Mr. Johnson, the Radcliffe observer. Under his care the Radcliffe Observatory at Oxford has done good service in science as well as in meteorology and in astronomy, and his loss will not easily be supplied, but several names are already mentioned as likely to succeed him. Among them, is that of Mr. Donkin, the eminent professor of astronomy, but it seems doubtful whether, were there no other difficulty, his state of health would allow him to accept the post.

May 17th.

One of the greatest engineering undertakings of late years has just been completed—the "Royal Albert" Bridge over the Tamar at Saltash, near Plymouth, forming a part of the Cornwall railway. The papers have contained an account of Prince Albert's journey into Cornwall to open it. The construction is peculiar, and although far more elegant than the simple "tubular" bridges at Conway and over the Menai Straits, engineers seem to doubt whether it is equally economical, and whether Mr. Brunel has gained a commensurate advantage in departing from that model. A sad accident has recently occurred on the railway of which it forms a part, but not all connected with the bridge itself.

The Atlantic Telegraph Cable has remained in the same ineffectual condition; at least so we must conclude from the perfect silence which is preserved on the subject. Inventors do not cease, however, to put forward various plans for its improvement. Mr. Hearder of Plymouth, whose theories on the subject we have before mentioned, has devised a plan for lessening the "discharge" which has proved so great a hindrance in working. In experimenting with leyden jars, Mr. Hearder found that any porous substance, such as paper, wool, cotton, &c., placed between the glass and the metallic coating, very much diminished the discharge. Applying this to the case of the Telegraph Cable, in which the glass is represented by the gutta percha insulator, and the metallic coating by the wire, he first tried placing some such substance between the wire and the gutta percha; here, however, another difficulty arose, for by this the inner surface of the gutta percha was so much enlarged that the inductive action, and consequent discharge were increased in proportion. By placing the porous substance between two layers of gutta percha, as for instance winding round threads of worsted, and then covering them with with gutta percha; more satisfactory results were obtained, and Mr. Hearder hopes in this way considerably to diminish this cause of inconvenience.

The common actinia or sea anemone of our shores has long given rise to disputes as to whether it possesses any poisonous powers or not, and supposing that it has, what is their nature, whether electric as some suppose, or owing to a distinctly poisonous secretion.

It has been noticed that different animals are affected in different degrees, and amongst those most suddenly paralysed is the Nereis, a humble seaworm. In order to try whether electricity had a powerful effect upon the creature, Dr. Waller sent through one of them a succession of shocks from an electrical machine strong enough to affect himself very powerfully, but they did little or no injury to the animal. Since it is so sensitive to the shock of the actinia, this would appear to be something different from electricity.

The controversy as who was the real discoverer of the composition of water which was carried on some years ago, has been to some extent revived. It had been believed from some assertions of the late Robert Brown, the great botanist, that he was in possession of some information on the subject which induced him to believe very confidently in the claims of Cavendish. His executor Mr. Bennett has in compliance with request, published the information to which he was believed to refer. It consists of no new materials, but refers to a published account by Deluc, of a visit he had paid to Birmingham in 1782, when he saw Priestley, who told him that Cavendish found that by mixing inflammable gas, and "dephlogisticated air" (*i.e.* Hydrogen and Oxygen) in proper proportions, and setting fire to them, the gases disappeared, and water was produced. This would seem to imply that Cavendish had communicated to Priestley not only his experiments, but the theory which be founded on them.

Mr. Muirhead, the advocate of Watt's claims, discredits the statement on the ground that Deluc afterwards in 1783, professed his ignorance of Cavendish's experiments. Since this account was written some years after the event, and has several inaccuracies are observable in the context, its authority is not

so great as that of the later passage. Mr. Muirhead believes that Priestley was aware of Cavendish's experiments though the latter had formed no theory, and on his "bungling repetition" of Cavendish's experiments, Watt founded his theory. The discussion does not add anything to our knowledge, and is chiefly valuable as shutting out the expectations which were formed from Mr. Robert Brown's papers.

F. P.

METEOROLOGICAL TABLE.

APRIL, 1859.

OBSERVATORY, SYDNEY.—LATITUDE, 33° 52' S.; LONGITUDE, 151° 12' E.; HEIGHT ABOVE SEA, 145 FEET.

DAY.	BAROMETER CORRECTED TO 32° FAHRENHEIT		WIND.				TEMPERATURE		CLOUD EXTENT		RAIN IN INCHES.	REMARKS.
			DIRECTION.		FORCE.		MAX.	MIN.				
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M.	9	9		
1	30·144	30·173	S.E.	S.E.	2	1	82·4	62·5	8	1	..	Fine throughout.
2	·189	·092	W.N.W.	N.N.E.	2	3	73·1	54·4	0	0	..	Fine; heavy dew at night.
3	29·974	29·770	W.	N.N.W.	1	3	88·0	56·5	0	2	..	Hot wind all day; changed in the night.
4	·881	·864	S.E.	S.	1	1	79·1	63·9	9	1	..	Fine.
5	·908	·938	W.S.W.	S.W.	1	1	74·1	59·6	2	0	..	Fine throughout; heavy dew.
6	·911	·838	W.N.W.	0	1	0	79·5	56·9	2	0	·010	Very fine; heavy dew.
7	·870	·875	N.W.	0	2	0	73·6	56·0	3	0	..	Fine throughout.
8	·930	·859	W.	S.	1	3	71·4	59·1	10	7	·046	A few brief showers; much lightning at night.
					1	1	75·1	62·1	10	3	·193	
9	·789	·737	W.	W.								Fine throughout; heavy dew.
10	·842	·752	W.	N.E.	2	2	75·1	61·7	3	0	..	Fine.
11	·670	·692	N.W.	W.N.W.	1	2	79·0	54·1	0	0	..	Fine.
12	·730	·860	W.N.W.	W.	3	2	77·6	56·0	0	0	..	Fine.
13	·888	·890	W.	W.	1	2	72·4	51·0	0	0	..	Fine.
14	30·012	30·067	S.W.	W.	3	1	69·0	50·3	0	0	..	Fine; cold day.
15	·107	·008	W.N.W.	N.W.	3	1	69·1	46·0	0	0	..	Fine.
16	·097	·109	W.	0	2	0	70·7	48·5	0	0	..	Fine; dew.
17	·122	·023	W.N.W.	E.N.E.	2	1	73·0	50·6	1	10	..	Fine; much light cloud; halo at night.
18	29·984	29·869	W.N.W.	N.	1	1	72·2	55·4	10	0	..	Slight fog; fine evening; heavy dew.
19	·915	·812	W.N.W.	E.N.E.	2	2	76·3	50·7	0	9	..	Very fine.
20	·902	30·112	W.	S.	1	5	68·9	51·2	4	10	..	Fine morning; gale from S. 11 a.m.
21	30·185	·146	W.S.W.	W.	1	3	68·9	48·9	1	1	..	Fine morning; strong S. wind 10 a.m.; light showers
22	·108	·060	S.W.	S.	1	3	62·3	49·4	10	0	·086	Rain early a.m.; fine evening
23	·016	22·922	W.	N.E.	1	2	71·9	47·0	0	0	..	Fine; heavy dew.
24	·056	30·059	W.N.W.	W.N.W.	2	1	70·5	50·5	0	0	..	Fine; very heavy dew.
25	·055	29·948	W.N.W.	0	1	0	70·5	50·1	2	2	·008	Fine; heavy dew at night.
26	29·956	873	W.	E.N.E.	1	1	74·0	48·6	0	0	·009	Thick fog at sunrise; fine day
27	·949	30·000	W.	S.E.	1	3	70·6	49·3	3	10	..	Fine morning; showers 7 and 9·30 p.m.
28	30·049	·066	E.S.E.	E.N.E.	2	2	68·9	59·9	10	1	·045	Showery morning; cleared at night.
29	·068	29·988	W.S.W.	E.	1	1	73·5	54·4	5	0	·033	Thick fog in the morning; fine day.
30	29·970	·854	W.N.W.	N.N.E.	1	1	79·0	55·0	0	1	·009	Thick fog, cleared 9 a.m. fine day.
Mean.	29·976	29·942			1·5	1·6	73·6	53·9	·31	·16	0·439	Days Rain 4

The extent of Clouds is represented by the number of tenths of the whole sky obscured at the time of observation.

The force of Wind is represented according to the Observer's judgment, by numbers from 0 to 6, 0 representing a calm and 6 a violent storm.

The adopted mean temperature is the mean of the Maximum, Minimum, 9 a.m. and 9 p.m. results.

HEALTH OF SYDNEY.

Registrar General's Office,
Sydney, 7th May, 1859.

APRIL, 1859.

The number of Deaths registered during the month of April was 103, viz., 56 males and 47 females.
The number of Deaths registered during the corresponding month of previous years was as follows :—

In 1856	129;	per centage undet five years	..... 44·19.
1857	94;	do. do.	..... 40·42.
1858	115;	do. do.	..... 42·60.
1859	103;	do. do.	..... 49·51.

The number of Births registered during April was 180, viz., 86 males and 94 females, being 77 in excess of the deaths.

Table shewing the Deaths of Males and Females Registered in each Ward from 1st to 30th April, 1859, distinguishing those under 5 years of age.

WARD.	Under 5 Years.			Above 5 Years.			Unspecified.		Grand Total.
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	
1.—Gipps	4	4	8	3	5	8	..	..	16
2.—Bourke*	2	1	3	11	8	19	..	..	22
3.—Brisbane	6	4	10	1	1	2	..	..	12
4.—Macquarie	1	2	3	2	..	2	..	..	5
5.—Cook	3	1	4	1	..	1	..	..	5
6.—Fitz Roy	4	5	9	3	7	10	..	..	19
7.—Phillip†	4	2	6	4	3	7	..	..	13
8.—Denison	6	2	8	1	2	3	..	..	11
Total	30	21	51	26	26	52	..	..	103

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1st TO 30th APRIL, 1859.

CAUSES OF DEATH.	Under 1 year.	1 and under 2	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 yrs.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages.
Zymotic Diseases. Endemic, Epidemic, and Contagious.	9	3	2	1	2	17	2	1	..	..	..	..	..	..	1	1	..	1	1	..	..	..	..	..	..	..	24
Sporadic Diseases. *Of Uncertain Seat.*—Dropsy and other Diseases of Variable Seat	12	..	..	..	..	12	..	..	1	..	2	..	1	..	1	1	1	1	..	..	..	..	..	..	..	..	20
Of Nervous System.—Diseases of the Brain, &c.	6	2	1	..	..	9	1	..	..	..	3	..	2	..	1	1	..	..	..	..	..	..	..	..	..	..	17
Respiratory System.—Diseases of the Lungs, &c.	1	..	..	1	..	2	1	..	..	1	..	..	5	..	1	..	1	1	..	..	..	..	..	..	..	..	12
Of Circulatory System.—Diseases of the Heart and Blood-vessels	1	..	..	..	..	1	..	..	..	..	..	..	1	..	1	..	1	..	..	..	..	..	..	..	..	..	4
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	2	5	1	..	..	8	2	..	..	..	2	2	..	..	..	..	2	..	1	..	..	..	..	..	..	..	17
Of Urinary Organs.—Diseases of the Kidneys, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.	..	..
Of Generative Organs.—Childberth, Diseases of the Uterus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Of Integumentry System.—Diseases of the Skin	1	..	1	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Old Age	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	2
External Causes.—Violence, Privation, and Intemperance	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	2
Unspecified	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	3
Total from all Causes	32	10	5	2	2	51	6	1	1	4	7	2	9		6	3	6	3	2		2						103

CHRIS. ROLLESTON, Registrar-General.

HEALTH OF SYDNEY.

Registrar General's Office,
Sydney, 7th June, 1859.

MAY, 1859.

The number of Deaths registered during the month of May was 113, viz., 61 males and 52 females.
The number of Deaths registered during the corresponding month of previous years was as follows :—

1856	131	1858	126
1857	90	1859	113

Deaths from Diseases of the Zymotic class bear a larger proportion than usual to the total mortality ; Gastric and Dysenteric complaints having proved fatal in a more than ordinary number of cases.
Two Deaths from Typhus Fever are also recorded.
The number of Births registered during May was 197, viz., 96 males and 101 females, being 84 in excess of the deaths.

Table shewing the Deaths of Males and Females Registered in each Ward from 1st to 31st May, 1859, distinguishing those under 5 years of age.

WARD.	Under 5 Years.			Above 5 Years.			Unspecified.		Grand Total.
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	
1.—Gipps	7	5	12	2	3	5	..	..	17
2.—Bourke*	2	1	3	18	6	24	..	..	27
3.—Brisbane	3	1	4	4	1	5	..	..	9
4.—Macquarie	0	3	3	0	0	0	..	..	3
5.—Cook	1	4	5	2	4	6	..	..	11
6.—Fitz Roy	4	6	10	2	3	5	..	..	15
7.—Phillip†.....	2	6	8	6	3	9	..	..	17
8.—Denison	6	1	7	2	5	7	..	..	14
Total.....	25	27	52	36	25	61	..	..	113

* The Infirmary is situated in Bourke Ward. † The Benevolent Asylum is in Phillip Ward.

SUMMARY OF DEATHS OF BOTH SEXES REGISTERED IN SYDNEY, FROM 1st TO 30st MAY, 1859.

CAUSES OF DEATH.	Under 1 year.	1 and under 2	2 and under 3.	3 and under 4.	4 and under 5.	Total under 5 yrs.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and under 45.	45 and under 50.	50 and under 55.	55 and under 60.	60 and under 65.	65 and under 70.	70 and under 75.	75 and under 80.	80 and under 85.	85 and under 90.	90 and under 95.	95 and upwards.	?	Total at all Ages
Zymotic Diseases. Endemic, Epidemic, and Contagious.	5	7	3	..	..	15	3	..	1	1	2	2	2	1	1	3	..	..	..	..	..	..	..	..	..	..	31
Sporadic Diseases. *Of Uncertain Seat.*—Dropsy and other Diseases of Variable Seat	9	..	..	..	..	9	..	1	..	..	..		1	1	1	..	..	..	..	..	..	..	..	..	..	..	13
Of Nervous System.—Diseases of the Brain, &c.	8	2	..	1	1	12	..	..	1	..	1	..	2	2	2	..	..		..	..	..	..	..	..	..	..	20
Of Respiratory System.—Diseases of the Lungs, &c.	1	..	..	..	..	1	..	..	1	3	3	2	..	..	1	2	1	1	..	..	..	..	..	..	..	..	15
Of Circulatory System.—Diseases of the Heart and Blood-vessels ..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	3
Of Digestive Organs.—Diseases of the Stomach, Liver, &c.	6	7	..	..	1	14	..	..	..	1	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	17
Of Urinary Organs.—Diseases of the Kidneys, &c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Of Generative Organs.—Childberth, Diseases of the Uterus	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1
Of Locomotive Organs.—Rheumatism, Diseases of the Bones, Joints, &c.	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..
Of Integumentry System.—Diseases of the Skin	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Old Age	..	..	..	..	..	..		..	..	..	..	..	..	..		..	..	1	..	..	3	..	..	..	..	..	4
External Causes.—Violence, Privation, and Intemperance	..	..	..	..	..	..	1	..	..	..	1		..	..	1	2	..	..	..	..	..	..	..	..	..	..	5
Unspecified	..	1	..	..	..	1	..	..	..	..	..	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	5
Total from all Causes	29	17	3	1	2	52	5	2	3	5	7	5	7	6	7	7	1	3		3							114

CHRIS. ROLLESTON, Registrar-General.

METEOROLOGICAL TABLE.

MAY, 1859.

OBSERVATORY, SYDNEY.—Latitude, 33° 52' S.; Longitude, 151° 12' E.; Height above the Sea, 145 Feet.

Day.	Barometer corrected to 32° Fahrenheit		Wind. Direction.		Wind. Force.		Temperature Max.	Temperature Min.	Clouds Extent.		Rain in Inches.	Remarks.
	9 A.M.	9 P.M.	9 A.M.	9 P.M.	9	9	9 P.M.	9 A.M	9	9		
1	29·850	29·810	N.N.W.	N.W.	3	3	83·5	62·0	8	2	..	Hot wind all day.
2	·999	30·007	E.S.E.	S.S.W.	2	1	77·5	60·6	2	7	..	
3	·951	·045	W.	S.	2	2	75·4	60·6	1	0	..	Fine throughout.
4	30·088	·086	W.	S.	1	2	73·0	54·9	2	0	..	Very fine.
5	·105	·020	N.W.	S.W.	2	1	73·2	54·4	1	1	..	Very fine.
6	·110	·057	W.	N.W.	1	1	68·2	52·2	2	0	..	Fine throughout; haze at night.
7	·063	·067	W.N.W.	W.	2	1	70·0	49.2	0	0	..	Fine throughout; heavy dew.
8	·174	·140	W.	W.	2	1	66·0	51·0	9	0	·10	Light rain early a.m.; fine evening.
9	·162	·159	W.	W.	2	1	65·2	47·1	1	1	·005	Fine.
10	·183	·125	W.N.W.	S.S.W	2	1	64·1	49·0	2	8	..	Rain 11 a.m. to 5 p.m.
11	·088	29·977	W.	N.W.	1	2	66·0	50·9	10	1	·472	Thick fog; cleared at noon.
12	29·858	·665	N.W.	W.	1	2	69·6	51·7	3	10	·067	Showery evening.
13	·893	·936	W.	W.N.W.	2	3	65·1	51·7	0	0	·060	Very fine throughout.
14	30·011	·898	W.	N.N.E.	2	2	65·5	45·6	0	7	..	Fine throughout.
15	29·663	·429	N.N.E.	N.N.W.	3	4	62·7	53 0	10	10	..	Showery from 10·30 a.m.
16	·586	·597	N.W.	N.	3	4	68·1	56·0	0	0	·030	Bright windy day.
17	·600	·502	N.N.W.	N.N.W.	2	3	69·0	56·0	0	0	..	Very fine.
18	·543	·634	N.W.	W.	1	1	66·6	53·5	1	2	..	Fine; light shower 19 p.m.
19	·628	·500	N.N.W.	N.	2	3	63·6	45·4	1	0	..	Fine.
	·504	·401	N.	N.N.W.	2	4	67·0	52·2	1	0	..	Fine; hard wind at night.
20	·438	·618	W.	W.N.W.	5	3	60·0	45·0	0	0	·116	Gale all day; moderate at night.
21												
22	·861	30·053	W.S.W.	W.	5	5	57·0	40·2	0	0	..	Steady gale all day.
23	30·132	·145	W.	W.	2	1	61·0	45·0	0	0	..	Fine.
24	·195	·149	W.N.W.	N.W.	2	1	61·8	43·0	1	0	..	Fine; heavy dew.
25	·213	·156	W.N.W.	N.N.E.	1	1	61·3	44·2	0	0	..	Fine; very heavy dew.
26	·154	·020	W.	N.	1	1	65·0	42·9	0	0	·004	Thick haze all day.
	29·918	29·832	N.	N.N.W.	2	1	72.2	47·3	C	3	..	Hazy morning; squall, with heavy rain, 6 p.m.
27												
28	·940	·918	N.W.	0	1	0	72·5	51·0	9	0	·166	Cloudy morning.
29	·921	·795	W.N.W.	W.N.W.	2	1	63·1	44 0	0	0	..	Fine.
30	·767	·816	N.N.W.	W.N.W.	1	3	65·3	45·9	0	0	·003	Fine.
31	·870	·899	N.W.	W.	2	5	59·2	43·9	0	0	..	Fine.
Mean.	29·916	29·886			2·0	2·1	67·0	50·0	21	·17	0·968	Days Rain 6

The extent of Clouds is represented by the number of tenths of the whole sky obscured at the time of observation.

The force of Wind is represented according to the Observer's judgment, by numbers from 0 to 6, 0 representing a calm and 6 a violent storm.

The adopted mean temperature is the mean of the Maximum, Minimum, 9 a.m. and 9 p.m. results.

SECOND REPORT

OF THE

AUSTRALIAN HORTICULTURAL

AND

AGRICULTURAL SOCIETY.

1857-58.

President:

HIS EXCELLENCY SIR WILLIAM DENISON, K.C.B., F.R.S.

Vice-Presidents:

THE HON. E. DEAS THOMSON, C.B.; THE REV. GEORGE E. TURNER.

Council:

MR. W. G. AINSWORTH,
„ J. BAPTIST,
„ J. E. BLAKE,
„ J. BLACK,
„ H. C. BURNELL,
„ W. CARRON,
„ F. CRESWICK,
„ E. DAINTREY,
„ W. DEANE,
„ R. DRIVER,
„ J. DYER,
„ J. GRAHAM,
„ M. GUILFOYLE,

DR. H. HOUSTON,
MR. W. M'DONELL,
„ J. M'DONALD, JUNR.
„ D. M'INNES,
„ G. H. ROWLEY,
„ T. W. SHEPHERD,
„ P. L. C. SHEPHERD,
„ E. K. SILVESTER,
„ W. S. WALL,
CAPTAIN WARD, R.E.
MR. THOMAS WALKER,
„ H. WAYMOUTH,
HON. E. WISE, M.L.C.

Honorary Treasurer:

MR. JOHN M'DONALD, JUNR.

Honorary Secretary:

MR. W. DEANE.

Assistant Secretary:

MR. H. R. WEBB.

SYDNEY:
PRINTED BY GUNTON TAYLOR, AT "BRADSHAW'S RAILWAY GUIDE" OFFICE,
6 & 8, CHURCH HILL.

1858.

SECOND ANNUAL GENERAL MEETING

OF THE

Australian Horticultural and Agricultural Society,

HELD IN THE

HALL OF THE CHAMBER OF COMMERCE, SYDNEY EXCHANGE,

ON TUESDAY, JULY 20, 1858.

HIS EXCELLENCY SIR W. DENISON, GOVERNOR-GENERAL,
PRESIDENT, IN THE CHAIR.

1st Resolution. Proposed by Mr. RICHARD KEYES, seconded by Mr. J. H. WILLIAMS,—

That the Report now read be adopted, printed, and circulated among the members. Carried unanimously.

2nd Resolution. Proposed by the Hon. Dr. BLAND, M.L.C.; seconded by Mr. J. E. GRAHAM,—

That the thanks of the Society be accorded to the President, Vice-Presidents, Honorary Secretary, Treasurer, and Council, for the satisfactory manner in which they have conducted its business. Carried unanimously.

3rd Resolution. Proposed by the Hon. W. G. PENNINGTON, M.L.C., seconded by the Hon. Dr. MITCHELL, M.L.C.,—

That Messrs. J. W. WAUGH and T. R. LEAVITT be appointed auditors for the ensuing year. Carried unanimously.

4th Resolution. Proposed by Mr. THOMAS SHEPHERD, seconded by Mr. G. A. BELL,—

That this meeting now proceed to ballot for the Council for the ensuing year, and that Dr. HOUSTON and Mr. MOUTREY, in conjunction with the Secretaries, take charge of the ballot box, and act as scrutineers. Carried unanimously.

5th Resolution. Proposed by Mr. J. E. GRAHAM, seconded by the Hon. Dr. BLAND, M.L.C.,—

That the Council be instructed to communicate with the Council of the *Cumberland Agricultural Association*, for the purpose of ascertaining how the two Societies may best be amalgamated; the result of such conference to be submitted to a Special General Meeting of the Society, to be called together for that purpose. Carried unanimously.

RULES.

1. That the objects of this Society shall be the encouragement, improvement, and development of Agriculture and Horticulture, and the promotion in every way of the productive capabilities of the soil, and with a view to the carrying out of these objects the Society shall, first—Hold meetings monthly, or otherwise, for the purpose of reading essays or papers, and lecturing on and discussing the various subjects connected with them; 2nd. Establish an experimental garden or farm, as soon as circumstances will permit; 3rd. Institute periodical exhibitions, at which prizes shall be awarded for superiority in all kinds of produce, stock, and manufacture, so far as connected with the aims of the Society; 4th. Promote the periodical publication of its transactions, and other useful information of a kindred nature, in a convenient form; 5th. Promote the establishment of affiliated institutions in the country districts, where practicable, and, where not, endeavour to form local corresponding committees; and 6th. As far as possible promote a friendly intercourse with kindred institutions in other countries, and particularly in the neighbouring colonies.

2. The management of the Society shall be vested in a President, Vice-Presidents, and a Council of twenty-four members, elected annually by ballot, at the annual general meeting of the Society, and a Secretary and Treasurer, who shall be elected by the Council, and be ex-officio members of it. Should any vacancy occur in the Council, by resignation or otherwise, the Council shall fill up such vacancy. The Council shall have power to make by-laws and rules for the conduct of its business, and the business of the Society generally, provided no such by-laws or rules shall be repugnant to the objects of the Society, or to any rules made by the Society at any of its general meetings. Five members of the Council to form a quorum.

3. The Society shall, in addition to the existing members of the two dissolved Societies, consist of members constituted as follows:—Members to be proposed at any meeting of the Society, and at any subsequent meeting to become members, unless a ballot be demanded by a member through the Secretary, when such ballot shall be proceeded with, and to pay one guinea entrance and one guinea per annum to the funds of the Society.

4. The annual general meeting of the Society shall be held in the month of July each year, for the purpose of auditing accounts, altering or amending rules, if required, and such other business as may be necessary for the welfare of the Society.

5. At least thirty clear days' notice must be given, through the Secretary, to the Council in writing, before any proposition for altering the rules of the Society can be entertained at any general meeting; such notice to set forth the proposed alteration.

6. All Life and Honorary Members of the two dissolved Societies shall continue to be Life and Honorary Members of this Society, with the same privileges as are now, or may hereafter be, declared by the Council of this Society.

BY-LAWS.

I. Election of Council.—On or before the 21st of June in each year, the Secretary shall cause a ballot paper to be printed, comprising the names and the number of attendances of the Members of Council for the time being at ordinary Council Meetings, and including the names of any other members of the Society who may be proposed for election, by written notice to the Secretary, on or before 14th June, a copy of such ballot paper to be furnished to any member on application.

II. Vacancies.—Should any vacancy occur in the Council, the Secretary shall announce the same at the next Council meeting, and any member of the Council may then, or, at any other meeting, propose a member of the Society to fill such vacancy; and the Council shall, at the next meeting, after such proposition, proceed to fill up such vacancy from the name or names proposed.

III. Council Meetings.—The ordinary meetings of the Council shall take place on the last Tuesday of each month, but the Secretary may at any time call a special meeting. Notice of all Council Meetings to be given by circular.

IV. COMMITTEES.—All Committees of the Council shall consist of three members at least,—the President, Vice-Presidents, and Honorary Secretary, to be at liberty to attend any Committee.

V. MONTHLY MEETINGS.—A meeting of members will be held on the first Tuesday in each month, for the purpose of reading essays or papers, and discussing all subjects connected with the objects of the Society.

VI. CHAIRMAN.—At all meetings of the Society, in the absence of the President and Vice-Presidents, a member of the Council shall be appointed to act as chairman.

VII. VISITORS.—Every member shall have the privilege of introducing two friends as visitors to the monthly meetings of the Society, on condition that they shall not already have attended two meetings of the Society in the current year. Ladies and non residents may be introduced by members as visitors to all monthly meetings.

VIII. SELECTION OF SUBJECTS.—Members desirous of reading papers, must give notice to the Council at the previous meeting.

IX. MEMBER'S CARDS.—Each Member shall be supplied yearly with a card of membership, and shall be entitled to two transferable tickets of admission to all exhibitions of the Society.

X. SUBSCRIPTIONS.—Annual Subscriptions shall become due on the first day of July, for the year then ensuing. The entrance fee and first year's subscription of a new member shall become due on the day of his election, and he shall not be entitled to attend the meetings, or to enjoy any of the privileges of the Society, until his entrance fee and subscription for the year have been paid. Members who have not paid their subscriptions for the current year, shall be informed of the fact by the Treasurer. If thirty days after such intimation any are still indebted, their names shall be formally laid before the Society at the first meeting.

XI. HONORARY MEMBERS.—Any person not residing in the colony, who may be distinguished as a scientific promoter of Botany, Horticulture, or Agriculture, or who shall become an approved correspondent of the Society, may be appointed by the Council an Honorary Member of the Society.

XII. HONORARY LIFE MEMBERS.—The Council may award Honorary Life Membership to the writers of the best papers or essays on subjects of importance, due notice of the competition for such a prize having first been given.

XIII. LIFE MEMBERS.—Any member paying the sum of ten pounds to the general funds of the Society, at one time, shall be a Life Member.

XIV. SECRETARY.—The Secretary shall summon and attend all meetings, and shall cause a minute book or books, containing the proceedings and transactions of the Society, to be kept and laid upon the table at all meetings of the Society (other than Committee meetings) for inspection.

XV. UNDER SECRETARY.—The Council shall appoint a paid Under Secretary, who shall be under the control and direction of the Honorary Secretary. Such Under Secretary may also be appointed Collector.

XVI. TREASURER.—The Treasurer shall receive payment of all monies due to the Society, and shall deposit the same as often as they amount to £20 in the Bank of New South Wales, to the credit of the Society. A financial statement shall be laid before the Council when required, and the pass-book made up to the day of each ordinary Council Meeting for reference.

XVII. PAYMENTS.—Claims against the Society, when approved by the Council, shall be paid by cheques signed by the Treasurer, and countersigned by the Secretary.

XVIII. AUDITORS.—Two Auditors shall be appointed at the General Meeting to audit the Treasurer's accounts. The accounts, as audited, to be laid before the Annual Meeting in July.

XIX. ADMISSION TO EXHIBITIONS.—The Public shall be admitted to all Exhibitions by cards, on payment of such charge as shall be agreed on by the Council.

XX. ADDITIONAL BY-LAWS.—A standing By-Law Committee shall be appointed, to whom all proposed alterations to, or additions to, the By-Laws shall be referred for their report.

XXI. That any Member of Council absenting himself from three consecutive Council Meetings without notice of intended absence, shall be deemed to have vacated his seat. The Council, however, shall at all times have power to give leave of absence or accept sufficient excuse.

SECOND ANNUAL REPORT

OF THE

AUSTRALIAN

HORTICULTURAL AND AGRICULTURAL SOCIETY.

THE Council, in placing the Second Annual Report before the members, have much pleasure in congratulating them on the present flourishing state and future prospects of the Society, which may now be considered as established among the useful and scientific institutions of the colony, and one in which the public evince great interest, as shown by the large attendance at the Exhibitions, and the desire evinced for the establishment of an experimental or model farm and garden. With reference to this highly important object it will be seen by last year's report that a suggestion was made in the Report of the Committee for the establishment of an experimental farm and garden, of the propriety of obtaining specific contributions for the purpose—in order that the Council might arrive at some idea of the amount required, the President kindly undertook to have plans and specifications prepared of the requisite farm buildings, which have been done gratuitously by Alexander Dawson, Esq., and for which the Council have accorded him a vote of thanks.

The Committee appointed also went carefully into the matter with reference to the stock and machinery, and found that the sum which would be required to commence operations might be set down at something like £10,000. The Council then decided on making an appeal to the public of New South Wales, which they have had printed together with the ground plan and bird's eye view of the buildings, forwarded to all the members, and being forwarded throughout the colony. A copy of the appeal is appended to the Report.

It occurred to the Council that the most fitting way of bringing the subject before the public would be its introduction at a public dinner given under the auspices of the Society. Accordingly the necessary arrangements were made, and the dinner held in the hall of the Sydney School of Arts, on the 27th May. His Excellency the Governor-General presiding on the occasion, and the sum of £897 15s. subscribed in the room.

Subscription lists have since been sent to most of the country members, but sufficient time has not yet elapsed to receive answers from them.

The Farm and Garden Committee have also visited the contemplated site for the farm, which is a portion of the Government Domain at Parramatta, having a frontage to Toonengabee Creek and Parramatta River, and consisting of about 250 acres. The Council would earnestly recommend to their successors in office the necessity of establishing Local Committees in the various towns, for the furtherance of this grand object, which must appear to all of the utmost benefit to the whole colony.

During the year there have been three Exhibitions held. One of Camelias, on 22nd July, held in the hall of the School of Arts, the collection of that magnificent flower being far superior to any previously exhibited. On account of the day being very wet the attendance of visitors was limited, and the expenses much greater than the receipts. The Spring Exhibition was held in the Botanic Gardens, on Thursday and Friday, 1st and 2nd October, which proved very successful, and a great number of Prizes awarded under the various heads of pot grown plants, cut flowers, fruits, vegetables, and agricultural and commercial articles. The receipts, on account of this Exhibition, being sufficient to cover the expenses and leave a balance to its credit; but by far the most successful Exhibition was the Autumnal, held 25th and 26th February, when, in addition to the usual display of the produce of the vegetable kingdom, there were several collections of useful agricultural implements, competing for a Silver Cup, of the value of ten guineas, the gift of Thomas S. Mort, Esq.

The Society's Gold Vintage Medals were competed for by the principal wine growers of the colony. A marked improvement was observable in the general quality of the wine. And in the event of there being another Grand Exhibition in Paris, Australia will be found to have made good use of her time since she gained her laurels there in 1855.

The Council regret that, from their inability to complete the requisite arrangements, they have, as yet, been unable to hold an Exhibition of Stock, as provided for in the Rules of the Society. They are, however, fully alive to the importance of the object, believing that from exhibitions of this kind, much good will arise to the colony, and trust the day is not far distant when the Society may hold its

Agricultural Exhibitions beneath the sheds in connection with the farm buildings at Parramatta.

During the past year twelve monthly meetings have been held, and well attended by the members, at which the following papers have been read :—

Mr. T. W. Shepherd—On native plants, and the pastoral, horticultural, and agricultural resources of Australia.

Mr. R. Meston—On the advantages of change of seeds.

Mr. J. E. Blake—On Australian wines (No. 2).

Mr. Theodore West—An analysis of the soil of the Hunter.

Mr. T. W. Shepherd—On native plants, and the pastoral, horticultural, and agricultural resources of Australia.

Mr. Theodore West—On a singular insect production found in some parts of Australia.

Mr. Robert Meston—On the deterioration and necessary renovation of colonial pastures.

Mr. F. Creswick—On Leghorn grass.

Mr. R. Meston—On the effects of acrid and poisonous plants upon graminivorous animals.

Mr. Lewis Markham—On the necessity for a better system of cultivation.

Mr. Lewis Markham—On a reaping machine, invented by himself, accompanied by a working model.

Mr. Robert Meston—On agricultural associations and improvement societies.

Mr. W. Stewart—On a simple mode of raising water by cattle power, exemplified by a working model.

Mr. P. L. C. Shepherd—On naming or numbering plants.

Mr. Lewis Markham—On the potatoe, its culture, disease, and preventative.

Mr. P. L. C. Shepherd—On the cultivation of the Clianthus Dampierri.

Mr. Henry Waymouth—On bone manures and superphospate of lime.

Mr. Lewis Markham—On the origin of vegetation.

Mr. Lewis Markham—On the pastoral pursuits of this colony.

Mr. Robert Meston—On the pastoral interest and general exhibition of live stock.

Mr. Lewis Markham—On Artesian wells.

Mr. Edwin Hickey—Observations on the cotton plant in Australia.

Mr. Robert Meston—On bones as a fertilizer of the ground.

In many instances animated discussions have taken place on the reading of the above papers ; the particulars of which have been placed before the public in the *Magazine of Science and Art*, which has been published monthly, and the twelve numbers bound up by the proprietor in a handy form for reference. The Council have entered into an arrangement for the continuation of the publication of the transactions of the Society for the current year through this medium, which they trust the members will encourage by their support.

The following donations of seed have been made to the Society during this year, viz. :—

California prairie or oat grass ; Italian rye grass, and Zulu Kaffir Imphee—from his Excellency the Governor-General. Kohl Kohl—from Mr. R. Garrett. Cotton, and a new Phæsolus—from Mr. Walter Hill, Moreton Bay. Horse-beans—from Mr. J. Gay. Sorghum saccharatum, and a new Holcus—Sir D. Cooper. Most of which have been distributed to persons throughout this and the adjacent colonies ; and in the case of the prairie grass, reports of the most favourable nature have been received, and it is looked upon as a valuable addition to our imported pasture grasses.

The following donations of books, &c., have been made during the same period :—

Leibig's Organic Chemistry, and Lindley's Elements of Botany—from Mr. F. Wilson. Sorgo and Imphee ; Cotton is King ; Plank Roads in the United States ; The Plough, the Loom, and the Anvil—from the Hon. E. Wise. The Plough, the Loom, and the Anvil ; three numbers of The Horticulturist ; one American Farmers' Magazine—from Mr. T. Leavitt. Several numbers of the Gardener's Chronicle—from Mr. W. M'Donnell. Drawings illustrating a paper read by Mr. T. West, on a singular insect production—from Mr. West. Specimens of various kinds of wheat—from Mr. G. A. Bell. A quantity of silkworm's eggs—from Mr. Knapp, jun. Samples of cotton, the produce of Moreton Bay—from Mr. Walter Hill.

The Council offered a premium of life membership for the best essay on the cultivation of cotton, and for the best essay on the growth of the vine and manufacture of wine, to be sent in by the 1st of June, 1858, for which premiums there have been no competitors. They would suggest to your future Council the desirability of again bringing this matter before the public. The Council have accepted a tender for the cutting a die for medals, on which will be an appropriate design. The die is to be completed within three months from this time, and will be formed in such a manner as will admit of its being attached to the presses at the branch of the Royal Mint, and will be able to strike the medals in gold, silver, or bronze.

The Council are still in receipt of communications of a friendly nature from the following societies :—

Society of Arts, Manufacture and Commerce, London.
Agri-Horticultural Society, Kandy, Ceylon.
Philosophical Society of Victoria.
Society of Agriculture, Santiago, Chili.

The Council again have much pleasure in tendering their grateful thanks to the President for his active exertions in furthering the interests of the Society.

The Council are also under great obligations to the Honorary Secretary for his personal attention and assistance at all times, as well as for his kindness in placing his office at the disposal of the Society.

In retiring from their office the Council, in conclusion, beg to recommend that the most strenuous exertions be made to carry out the eminently useful objects which have been initiated during their term of office.

Much expense has been already incurred; a large expenditure must necessarily take place to effect even a portion of the operations of the coming year, and they hope that the new Council will continue the noble work as happily begun, looking to the anticipated great results as an ample reward for their exertions.

The number of members on the books are 580.

APPEAL FROM THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

To the Public of New South Wales.

THE Council of the AUSTRALIAN HORTICUTURAL and AGRICULTURAL SOCIETY appeals to the Colonists for aid and support, in its attempt to establish an *Experimental*, or *Model Farm and Garden*. And it does so, with confidence of a favourable result, inasmuch as the direct influence which similar institutions have exercised in the advancement and prosperity of all older and more densely peopled countries, is so patent as to command universal acknowledgment; added to which, the peculiar circumstances under which the Australian Colonies (and more particularly New South Wales), both by nature and by human interference, are placed, renders movements of such a nature more necessary here, than perhaps in any other country on the face of the globe. The Council, therefore, wish that every true colonist will strive to promote the object in view to the utmost of his opportunities.

The Society which this Council represents was organized on the 8th December, 1856, for the purposes set forth in the 1st fundamental rule of its constitution, as follows:—

1st. That the object of this Society shall be the encouragement, improvement, and development of Agriculture and Horticulture, and the promotion in every way of the productive capabilities of the soil, and with a view to the carrying out of these objects, shall, 1st.—Hold meetings monthly, or otherwise, for the purpose of reading essays or papers, and lecturing on and discussing the various subjects connected with them; 2nd.—Establish an experimental garden or farm, as soon as circumstances will permit; 3rd.—Institute periodical exhibitions, at which prizes shall be awarded for superiority in all kinds of produce, stock, and manufacture, so far as connected with the aims of the Society; 4th.—Promote the periodical publication of its transactions, and other useful information of a kindred nature, in a convenient form; 5th.—Promote the establishment of affiliated institutions in the country districts, where practicable, and, where not, endeavour to form local corresponding committees; and, 6th.—As far as possible promote a friendly intercourse with kindred institutions in other countries, and particularly in the neighbouring colonies.

Most of the provisions of this rule have been carried out with acknowledged success. But the establishment of an experimental farm and garden is an undertaking which requires long and careful consideration before entering upon, and the Society has not yet been in possession of even an approximation to sufficient funds, either to secure the land or to defray the preliminary expenses of such an undertaking. And the Council feels, that to involve the Society in debt would not only jeopardise the success of the undertaking, but render failure probable, such an event would be most likely to delay for an indefinite period any further attempt of the same nature. It has, therefore, been determined to make an appeal to the public, with a view to the establishment of a special fund for the purpose, which it is confidently anticipated will be responded to both promptly and liberally. The Government has already been petitioned for the grant of a suitable site, and a favourable reply has been received, with the reservation that it would be incumbent on the Society to have possession of reasonable means for carrying out the proposal. Upon receipt of this reply, a Committee of this Council was appointed to report upon the best mode of providing the necessary funds, which reported as follows:—

Your Committee have to report, that so short a period has elapsed since their appointment, that they have been unable to do more than meet and deliberate upon the best means of attaining the desired object.

They regret this the less, however, from the fact of the near approach of the Annual General Meeting rendering necessary the election of a new Council, and will, therefore, confine themselves in this Report to stating very briefly their views and opinions as to the best mode of procedure.

Your Committee have not been able to ascertain, with any degree of accuracy, what portion of the Society's funds can be devoted to this object, but while they hope that considerable assistance may be derived from this source, they cannot shut their eyes to the fact that large additional aid will be requisite to enable the Council to carry out, in their integrity, the objects they had in view in applying for the land.

Your Committee would beg, therefore, to suggest for the consideration of the Council, the propriety of obtaining specific contributions for this purpose, and, with that view, would recommend the organization of Local Committees in the various districts of the Colony, and the appointment of Collectors to obtain subscriptions.

And that, to forward such organization in the first instance, Circular Letters be printed and extensively circulated; such Circulars to clearly set forth the advantages derivable from the object proposed.

(Signed) OSBORNE OTTLEY, *Chairman.*

Sydney, 13th July, 1857.

Adopted 13th July, 1857. H. R. WEBB, *Acting Secretary.*

In adopting this Report, the previous Council felt that the time had arrived when something should be attempted, and the present Council entirely coincides with this view; and therefore, now, in appealing to the public for assistance, desires to detail some of the practical advantages which an experimental farm and garden (properly conducted) cannot fail to bestow upon the general welfare of the country, both directly and indirectly.

1st.—Attention would be devoted to the introduction of, and improvements in the breed of Stock, in all its varieties, to which might be added experiments in fattening the same, both on pasture and in the stall. And of course, in these experiments, the improvement of the staple production of the Colony—Wool, would necessarily take the most prominent place.

2nd.—The introduction and trial of grasses and other fodder plants, calculated to improve and enrich our natural pasture lands, which are on all hands admitted to be deteriorating at a rate which, in a few years, must prove utterly ruinous, if something be not done to arrest the evil.

3rd.—Plants and trees for field and garden culture, would also be introduced, their suitability to the climate, and their commercial value tested; as would also all those plants indigenous to the country, which might be presumed to offer reasonable grounds for anticipating improved usefulness, under scientific cultivation and treatment.

4th.—Improved Agricultural Machinery would be introduced and tried. And when found well calculated for the purpose intended, Farmers and others would be specially invited to witness them in operation. Thus making the colonists practically acquainted with their uses and advantages, in a more efficient and speedy manner than could be brought about by any other means; besides, such experiments would tend, in a very material degree, to save the money of the country. For it would not only prevent the purchase of Machines, over and over again, long after individuals had proved them unsuited to the colony, as is frequently seen now, but would also tend, in a high degree, to bring into general use labour-saving implements and machinery, of which no country stands in greater need than this.

5th.—The advantages of irrigation would be practically illustrated, and there can be little doubt that a few experiments, successfully carried out, would tend more to convince the colonists of its benefits, than ten thousand volumes of well written books.

6th.—Manures of all kinds would be experimented upon, and their adaptation to the soil and climate of the country, properly tested.

7th.—Particular attention would be paid to the dissemination for cultivation of such seeds and plants as shall have been found of value, as well as those which it may be considered desirable to distribute for further and more numerous trials.

8th.—Experiments in the hybridization of plants would be undertaken with the view of raising new and improved varieties, particularly in plants of the most general utility.

9th.—By a systematic arrangement of *plants*, in the garden, facilities would be afforded to men of science for investigating their properties, and the commercial or other value, which their products might possess; and also to Students, for acquiring that knowledge of the phenomena of vegetable organization, without which experiment and research were vain.

More particular detail need not now be entered upon. And the Council desires it to be distinctly understood that only such experiments and trials, the result of which would evidently tend to the direct advantage of the country, would be carried out; experiments of an expensive nature, and for the solution of mere abstract questions of science, would be avoided.

To enable the Society to procure a grant of land suitable for a site for the contemplated farm and garden, it is believed that (as will be seen by the annexed Plans and Estimates) a sum of £10,901 19s. 2d. would be required to cover the cost of Fencing and Stocking the Farm, and erecting the necessary buildings; a portion of this sum it is hoped will be granted by the Legislature for a purpose of so essentially a public character, but as any grant on the part of the Legislature will probably have the condition annexed to it, that a proportionate contribution should be made by the public. When the farm and garden are once brought into full working order, it is expected that it will be a self-supporting Institution, from the income derived from the sale of improved Stock

and other Farm Produce. It is earnestly urged that Colonists in the various districts will set on foot such measures for the furtherance of the object, as may seem most expedient. Subscription Lists will be forwarded to each Bench of Magistrates throughout the Country, and may also be obtained on application to the Secretary of the Society. All Subscriptions for this Fund to be reserved expressly for it.

W. DENISON,

President.

9, Hunter Street, Sydney.

ESTIMATE ABOVE REFERRED TO.

	£	s.	d.	£	s.	d.
Machinery				1000	0	0
Stock				1000	0	0
Dwelling House, Office, and Dairy...	1924	14	3			
Wood Shed	19	4	1			
Calf House	61	2	10			
Cow Shed	378	18	9			
Green Forage Barn	132	4	5			
Horse Stable and Loose Box	358	2	6			
Cart Shed, Carpenter's Shop, and Granary over ...	531	3	9			
Engine House, with Engine...	578	19	3			
Barns	1077	10	7			
Piggery, Privies, and Fowl House...	254	17	9			
Exhibition Shed	649	8	1			
Manure Tanks and Drains	418	9	6			
Watertank, under-ground Piping, Spouts, &c. ...	627	5	8			
Fencing, Gates, Horse Troughs, &c.	89	17	9	7101	19	2
Fencing Paddocks, &c.				800	0	0
Superintendence, Labour, and Contingencies for first Twelve Months				1000	0	0
				£10,901	19	2

BALANCE SHEET.

THE TREASURER IN ACCOUNT CURRENT WITH THE AUSTRALIAN HORTICULTURAL AND AGRICULTURAL SOCIETY.

1858-59.		£	s.	d.
	To balance from last year	146	17	6
	„ Subscriptions received	442	6	0
	„ Cash taken at the gates during exhibitions ..	251	18	7
	„ Tickets sold	17	14	0
	„ Prize overpaid	1	10	0
		£860	6	1
July 1st,	To Balance to Credit of Society	222	10	0

1858-9.		£	s.	d.
	By Cash Mr. W. H. Catlett's Salary	41	4	0
	„ „ Prizes	102	3	0
	„ „ G. Gay, erecting tents, &c.	61	4	4
	„ „ Expenses at Exhibitions..	33	6	3
	„ „ Assistant Secretary's Salary	106	16	10
	„ „ Band at Exhibition	45	10	0
	„ „ Repairs and alterations to the tents ..	11	13	0
	„ „ Posting Bills	4	7	6
	„ „ Postage Stamps	18	12	6
	„ „ Subscription to Magazine of Science & Art	13	15	0
	„ „ Advertising	44	6	6
	„ „ Stationary..	9	2	3
	„ „ Commission to Collector	31	8	0
	„ „ Printing	65	1	6
	„ „ Hire of Rooms for Exhibition & Meetings	19	18	0
	„ „ Police at Exhibitions	6	0	0
	„ „ Stamp for Letters, &c.	2	5	0
	„ „ Delivering Reports	3	2	0
	„ „ Cab and 'Bus Hire, Portage and Cartage	2	8	6
	„ „ Subscriptions overpaid	3	3	0
	„ „ Petty Cash	12	8	11
	„ „ Cash in Secretary's hands	5	16	11
	„ „ Balance in Bank of New South Wales..	216	13	1
		£860	6	1

F. MITCHELL, TREASURER.

LIST OF MEMBERS.

Aaron, Dr.
Abbott, Ben., Mr.
Abbott, R P., Mr.
A'Beckett, A. M., The Hon.
Abrahams, A., Mr.
Adams, A. A., Mr.
Ainsworth, W. G., Mr.
Aitken, W., Mr.
Aitken, David, Mr.
Aitken, John, Mr.
Alderson, W. M., Mr.
Alexander, John, Mr.
Alexander, Maurice, Mr.
Allan, Mr.
Allen, The Hon. George
Allen, George Wigram, Mr.
Allen, Joseph, Mr.
Allen, W. B., Mr.
Anderson, Robert, Mr.
Andrews. R., Mr.
Andrews, J., Mr.
Archibold, Mr.
Arkins, John, Mr.
Aspinall, Mrs. Edward

Badgery, Henry, Mr.
Baker, John, Mr.
Baker, Thomas, Mr.
Baptist, John, Mr.
Bardwell, T., Mr.
Barney, Colonel
Barker, Thomas, Mr.
Barre La, Miss
Bath, C., Mr.
Battye, Captain
Beattie, Benjamin, Mr.
Beilby, E. T., Mr.
Bell, James, Mr.
Bell, David, Mr.
Bell, G. A., Mr.
Bennett, Francis, Mr.
Berncastle, Dr.
Bibb, John, Mr.
Birch, Robert, Mr.
Black, J. H., Mr.
Black, J., Mr.
Bland, William, Dr.
Blake, J. E., Mr.
Blaxland, William, Mr,
Blaxland, John, Mr.
Blaxland, Charles, Mr.
Bowden, Thomas, Mr.
Bradley, H. B., Mr.
Bramwell, John, Mr.
Bray, Mr. W.
Breillat, T. C., Mr.
Brenan, J. R., Mr.
Brenan, John O'Neil, Mr.
Broadhurst, Edward, Mr.
Brooks, Richard, Mr.
Broom, Mr.
Broughton, W. H., Mr.
Broughton, Thomas, Mr.
Brown, Andrew, Mr.
Brown, J., Mr.
Buckland, W., Mr.
Bugle, W. L., Mr.
Burdekin, Lloyd, Mr.
Burnell, H. C., Mr.

Campbell, Alexander, Mr.
Campbell, Miss
Campbell, Robt., the Hon., M.L.A.
Campbell, J. R., Mr.
Campbell, O. R., Mr.
Campbell, George, Mr.
Cameron, E. W., Mr.
Cape, W. T., Mr.
Carr, J., Mr.
Carr, V., Mr.
Carron, Wm., Mr.
Castles, Frederick, Mr.
Chalder, Thomas, Mr.
Chapalay, Louis, Mr.
Chisholm, George, Mr.
Clarke, W. M., Mr.
Clark, Thomas, Mr.
Clarke, J. R., Mr.
Cleeve, J. K., Mr.
Clarkson, D. W., Mr.
Cole, Stephen, Mr.
Coleman, George, Mr.
Comrie, The Hon. James
Cooke, John, Mr.
Cooper, The Hon. Sir Daniel
Cooper, John, Mr.
Cowper, Charles, The Hon., M.L.A.
Coveney, Robert, Mr.
Cox, George, Mr.
Cox, Edward, Mr.
Creswick, F., Mr.
Cripps, Thomas, Mr.
Croft, John, Mr.
Croft, Frederick, Mr.
Crook, S., Mr.
Crow, James, Mr.
Curry, R., Mr.

Daintrey, E., Mr.
Dalley, W. B., Mr., M.L.A.
Darvall, The Hon. J. B.
Davis, Thomas, Mr.
Dawson, William, Mr.
Dawson, R., Mr.
Day, Thomas, Junr., Mr.
Day, Thomas, Senr., Mr.
Davy, A., Mr.
Dean, William, Mr.
Deane, William, Mr.
De Lange, Mr.
Denison, Sir W., Gov. General
Dibley, E., Mr.
Dick, Alexander, Mr.
Dixon, Joseph, Mr.
Donaldson, S. A., Mr., M.L.A.
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Driver, Richard, Senr., Mr.
Driver, Richard, jun., Mr.
Drynan, W., Mr.
Dunsmure, John, Mr.
Dyer, Joseph, Mr.

Ebsworth, J. E., Mr.
Ebsworth, O. B., Mr.
Evans, C. M., Mr.
Evans, George E., Mr.

Fairfax, John, Mr.
Falconer, J. J., Mr.
Fanning, William, Mr.
Favenc, P., Mr.
Feez, Adolph, Mr.
Field, T., Mr.
Felton, Maurice, Mr.
Ferris, H., Mr.
Ferris, H., Mr., Pitt-street
Ferguson, Francis, Mr.
Fitzgerald, the Hon. R., M.L.C.
Flavelle, John, Mr.
Fletcher, David, Mr.
Ford, Frederick, Mr.
Foss, Ambrose, Mr.
Foss, Thomas, Mr.
Francis, B., Mr.
Freeman, W., Mr.
Freericks, B., Mr.
Fullerton, Rev. J., D.D.

Garrett, Richard, Mr.
Garrett, H. Bond, Mr.
Gey, John, Mr.
Gibbes, Colonel
Gilchrist, John, Mr.
Glover, Thomas, Mr.
Gordon, S. D., M.L.A.
Gordon, Mr.
Gore, Ralpt. T., Mr.
Gorman, J. V. Mr.
Graham, Joseph, Mr.
Graham, J. E., Mr.
Graham, W., Mr., life member
Gray, John, Mr.
Greenup, Dr.
Greville, Wm., Mr.
Griffiths, G. R., Mr.
Grocott, J., F., Mr.
Guilding, Mr.
Guilfoyle, M., Mr.

Haege, Herman, Mr.
Haines, R., Mr.
Hall, T. B., Mr.
Hamburger, F., Mr.
Hampton, Mr.
Hardiman, Mr.
Hardy, J., Mr.
Harmer, William, Mr.
Harpur, Dr.
Harris, C. H. W., Mr.
Harris, S. H., Mr.
Harris, James, Mr.
Harrison, J. R., Mr.
Hart, James, Mr.
Hatton, R. L. W., Mr.
Hay, The Honorable J., M.L.A.
Hebblewhite, S., Mr.
Hemming, William, Mr.
Henderson, R., Mr.
Heydon, J. K., Mr.
Hickey, Edwin, Mr.
Hill, The Hon. George, M.L.C.
Hill, Richard, Mr.
Hill, John, junior, Mr.
Hill, W., Mr., honorary member
Hill, Edward, Mr.
Hill, Francis, Mr.
Hilly, J. F., Mr.
Hodgson, Arthur, Mr.
Holden, G. K., Mr.
Holden, J. Rose, Mr.
Holdsworth, J. B., Mr.
Holman, J., Mr.
Holt, Thomas, Mr.
Houston, Dr. H.
Houston, Dr. W.
Hurford, L. W., Mr.
Hutchinson, R., Mr.
Howell, George, Mr.

Hughes, S. T., Mr.
Husband, James, Mr.

Icely, Thomas, Mr.
Ingelow, G.K., Mr.
Ingold, Zachary, Mr.
Inman, W. J., Mr.
Irby, Edward, Mr.
Irving, Clark, Mr.
Isaacs, The Hon. R.M., M.L.C.

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Jamison R.T., Mr., M.L.A.
Jaghers, Mr.
Jenkins, R.P., Mr.
Jessop, C. Mr.
Johnson, Robert, Mr.
Johnson, Captain, R.N.
Johnson, John, Mr. Singleton.
Jones, The Hon. David, M.L.C.
Jones, J. R., Mr.
Jones, J. S., Mr.
Josephson, J. F. Mr.
Joubert, D. N., Mr.

Keen, W. Mr., life member.
Kemp, Charles, Mr.
Kent, Mr.
Kenyon, Joseph, Mr.
Kelly, O. F., Mr.
Kerchner, W., Mr.
Keys, Richard, Mr., life member.
Kidd, Mr.
King, Francis John, Mr.
King, P.R., Mr.
Knapp, E. junior, Mr.,
Knox, Edward, Mr.

Lamb, The Hon. John, M.L.C.
Lamb, John, Mr.
Lamb, Walter, Mr.
Lamb, Richard, Mr.
Lambert, Mr.
Lambeth, R., Mr.
Langley, Charles, Mr.
Lasseter, F. Mr.
Lavers, J. V., Mr.
Lawson William, Mr.
Leathes, A. Stanger, Mr.
Leavitt, Thomas R., Mr.
Lenehan, A., Mr.
Lenon, John G., Mr.
Lethbridge, R. C., Mr.
Levey, Isaac, Mr.
Lloyd, G. A., Mr.
Loder, Andrew, Mr.
Lubeck, Henry, Mr.
Lucas, J., Mr.
Lynch, E. M., Mr.

Macarthur, The Hon. James, M.L.A.
Macarthur, A., Mr.
McCulloch, A., Mr.
Macdougall, Andrew, Mr.
McEwan, D. P., Mr.
Macnamara, John, Mr.
Macnamara, James, jun., Mr.
McBean, Mr.
McCarthy, W. G., Mr.
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